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ABSTRACT

This study examined (1) the level of symbolic capability as revealed in play, (2) the use of spontaneous vocal imitation, and (3) the nature of certain classes of words occurring in spontaneous infant language. Facets of child behavior were examined during the period of single-word utterances and early multiword combinations with a view to elucidating certain cognitive aspects of early language. The temporal sequencing of development in these areas was analyzed and compared in five females aged 14-19 months. The infants, observed monthly in the home for 40-minute periods over a 1-year span, were presented with a standard set of toys and engaged in free play and conversation with their mothers. These sessions were videotaped, and language and play were analyzed. Study findings indicated consistent patterns of vocal imitative behavior and symbolic development. Symbolic play level was predictive of linguistic behavior. The use of language to code precursors of operational intelligence was remarkably consistent for all children observed. It is suggested that cognitive skills developed during the sensorimotor period form the foundation for these patterns of development. (CS)

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FINAL REPORT

A LONGITUDINAL STUDY OF REPRESENTATIONAL PLAY IN RELATION TO SPONTANEOUS IMITATION AND DEVELOPMENT OF MULTI-WORD UTTERANCES

National Institute of Education Project No. NE-G-00-3-0021

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SUMMARY

The purpose of this investigation was to examine the level of symbolic capability as revealed in play, the use of spontaneous vocal imitation, and the nature of certain classes of words occurring in spontaneous infant language. These three facets of child behavior were examined during the period of single-word utterances and early mutli-word combinations with a view to elucidating certain cognitive aspects of early language. The temporal sequencing of development in these areas was analyzed and compared across children.

Five female subjects, ranging in age from 14 to 19 months at the time the study began, were observed monthly in the home over a one-year time span. The children were presented with a standard set of toys and engaged in free play and conversation with their mothers. These sessions were videotaped, and language and play were analyzed.

The major conclusions of this study are that there are consistent patterns of vocal imitative behavior and of symbolic development. Symbolic play level was predictive of linguistic behavior. The use of language to code precursors of operational intelligence was remarkably

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consistent for all children observed. It is suggested that cognitive skills developed during the sensorimotor period form the foundation for these patterns of development.

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CHAPTER I

PROBLEM STATEMENT AND THEORETICAL PERSPECTIVE

With the recent increase in the study of infant language development and of qualitative changes in cognitive development during the sensorimotor period, there are data accumulating which may lead to a common framework for considering the development of thought and language, thereby increasing understanding of both. The beginning of the 1970's has seen an increasing rapprochement between psychologists and psycholinguists interested in the acquisition of natural language. The focus of this coming together according to Bloom (in press) is the increasing evidence that early cognitive development rather than innate grammatical knowledge is the basis for the emergence of language. Consequently, there is current interest in developing an adequate cognitive theory of language acquisition. Brown (1973) suggests:

> There is probable hidden progress in the latter part of the sensorimotor period from the schema that is performed to the proposition that is thought and eventually expressed. Multi-word utterances may wait on this progress [p. 106].

In Piaget's terms, this progress is the development

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of mental representation.

With a few exceptions, such as Brown (1973) and Schlessinger (1971), studies of infant cognitive development have not considered language acquisition and development (Corman & Escalona, 1969; Piaget, 1962). Similarly, studies of language development have emphasized syntax and linguistics almost to the exclusion of cognitive development (Greenfield, Smith, & Laufer, in press; McNeill, 1970). Attention to the relationship of the two, language and cognitive development, is needed.

This investigation was designed to develop a longitudinal approach for considering areas of overlap in cognitive and language development for children at the beginning stages of language. Three aspects of child behavior were considered in this research: the development of symbolic play, the use of vocal imitation, and the emergence of a certain class of words related to the logico-mathematical categories of human knowledge proposed by Piaget (1969).

Developmental changes in these variables were observed, and the children compared, to investigate the generality of the sequences observed. The relationships between the sequences observed were then examined. The common characteristic of these kinds of child behavior is their basis in cognition emerging from the sensorimotor

period. This research assumed that language, too, is a cognitively based ability which is derived from sensorimotor intelligence, and develops during the preoperational period.

Symbolic play provides a non-linguistic measure of symbolic development which parallels language in several ways. Early symbols in play, like early words, are single units. Later these are combined, then planned or conceptualized before they are played, and finally organized into conventional sequences based on reality. Language begins with single words and develops toward syntax which is rigidly conventional in its sequences. If language is part of a general symbolic function, parallel development in symbolic play and the use of verbal symbols would be expected.

Imitation is a response following a model which repeats all or part of the model. It is emphasized by Piaget as leading to the development of mental representation. It is commonly observed that children imitate language they hear. Exploration of vocal imitation, in relationship to developments in language and symbolic play was undertaken to clarify the function of imitation and relate it to cognition.

Piaget (1969) distinguished between figurative and operative knowing. Sinclair (1970) identified certain

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words as referring to the operative aspects of practical intelligence emerging during the sensorimotor period. This investigation identified words of this type as used by the subjects and explored the kinds of relationships to which they referred. Further, the development of this class of words was observed and compared across children with reference to symbolic development and imitation.

Development of Symbolic Representation

In what ways do language characteristics reflect the underlying cognitive capacity of the child during the period from the emergence of single words to the time when word combinations come to predominate? The theoretical work of Piaget (1962) and Werner and Kaplan (1963) suggests that language emerges as a part of a general symbolic function, the capacity for mental representation. According to both of these sources, initial representations are not mental, but external, in the form of imitations.

Symbolic Development According to Werner and Kaplan

Werner and Kaplan (1963) present a theory of symbolic development in relation to language development which emphasizes imitation. They attempt to account for the process by which "the organism forms its objects, transforms material into symbolic vehicles [words] and

establishes a relationship of representation between vehicle and referent [p. 17]." Imitation of objects is considered a primary process in this construction. In order to explain the formation of words as symbols for reality, there must be an understanding of the mechanism through which a conceptual object can come to be represented by a sound pattern, very different from the object itself.

The answer to this problem for Werner and Kaplan (1963) is found in the infant's early sensitivity to the expressive properties of objects which he eventually expresses in imitation. The movements and vocalizations of infants reflect the expressiveness of objects, at first unconsciously, as an adult might tap in time to music. Later this behavior becomes intentional, leading to imitations of movements and sounds of objects. Such imitations of object sounds are reported frequently as the first identifiable "words" in the diary studies reviewed by Werner and Kaplan. It is notable that these early onomatopoetic words utilized the phonemes available to the child within the native language to which he was exposed. Stern's child employed such expressions as "r-r-r" to "name" a coffee grinder or "s-s-s" to indicate the hissing of a flower syringe (Stern, 1928, p. 383), sounds which are German language phonemes. Whether onomatopoetic

expressions are offered to a child by an adult or formed by him spontaneously, such expressions always involve translations of perceived sounds into the speech system. According to Werner and Kaplan (1963):

> It is by their very virtue as linguistic patterns built by definite speech sounds and not by indefinite babblings that onomatopoetic forms can be further shaped into more complex products, assimilated to the rhythmic structure of the surrounding language, and stabilized into units that are handled like other words in the child's speech [p. 103].

As symbols, however, these words are initially very close to the phenomena they represent. In other words, imitation of objects is suggested as a process leading to symbolic behavior.

Imitation as seen by Werner and Kaplan is therefore a constructive process set in motion by an external stimulus, but it is also the result of internal organizing ability on the part of the child. It therefore has a cognitive component reflecting the level of representation of the child. Piaget (1962) places similar emphasis on the cognitive basis of imitation and its importance for development of mental representation.

Symbolic Development According to Piaget: Sensorimotor Stages

Piaget distinguishes six sensorimotor stages in infancy prior to the development of mental representation. Imitation is one cognitive skill which develops as the

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child progresses through the six stages. Piaget considers initial mental representations to be internal imitations. That is, the actions and sounds that were previously imitated externally with sensorimotor movements now take place mentally. These internal imitations are considered to be the same as previous sensorimotor imitations although they omit the external sensorimotor action component. Development toward mental representation can be judged by the extent to which the child has established object permanence, the ability to keep an object in mind when it is out of sight. This ability and the ability to imitate develop in parallel during the first two years of life, both reflecting the growth toward mental representation.

During the late sensorimotor stages, object constancy tasks can be used to assess the development of symbolic behavior other than language which is beginning to develop at that time. Theoretically, because language is considered dependent on representation, words as conventional symbols are not expected before Stage VI. However, this hypothesis has not been tested. Onomatopoetic expressions such as those described by Werner and Kaplan (1963) could be expected earlier.

Sensorimotor Stages I-III. From birth through Stage III, progress toward mental representation involves mainly the development and coordination of reflexes

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(Stages I and II) and the development of an orientation toward objects which leads the child to try to continue interesting events once they have begun (Stage III). Consideration of the development of object constancy and imitation from Stages IV through VI reveals the steps by which the child gradually constructs more complex levels of representation.

Sensorimotor Stage IV. At Sensorimotor Stage IV, if an object is hidden under a cloth while the baby watches, he will find it immediately. However, if a second cloth is added and the object hidden under it, the baby persists in searching only at the first location, and appears surprised the object is not there. The object is still a part of the total picture in which it was perceived. The child cannot imagine it at another location, even if it is placed there as he watches.

This is the stage when the child first attempts to imitate new models. The child selects models to be imitated at this stage. Previously the child imitated only those sounds and movements already in his repertoire. Now he tries to reproduce sounds and movements which are new to him, and yet comparable to those he has already made.

Piaget (1962) interprets the selection of models for imitation as follows:

> The interest thus appears to come from a kind of conflict between the partial resemblance which makes the

> child want to assimilate and the partial difference which attracts his interest the more because it is an obstacle to immediate reproduction. It is therefore this twofold character of resemblance and opposition which seems to be the incentive for imitation [p. 51].

Piaget's daughter, J., for example, first reacted to a sound that was new to her in the following way: "Abou" had been a frequent phoneme used by J. At eight months of age when her father said "vou vou vou," she at once responded "bou bou bou," which was analogous to her earlier phoneme, "abou." Previously "vou vou vou" had produced no reaction from her.

Sensorimotor Stage V. At Sensorimotor Stage V, the object is less a part of a single perceptual context. As long as the child watches the placement of the object in various hiding places, he is able to solve object permanence tasks. The child at this stage uses trial and error to solve sensorimotor problems such as this, as well as to imitate new models. For example, Piaget's daughter J. began to imitate words in adult speech, not identical with spontaneous phonemes of her own, in the following ways:

> In response to the word "parti" J. said "Papeu," doubtless through analogy with "papa." Afterward of her own accord, she said "papeu" when people went out of the room or when things came to an end, and she gradually corrected it to "pati" [Piaget, 1962, p. 54].

Sensorimotor Stage VI. Sensorimotor Stage VI is

the transitional period between sensorimotor action and mental representation. Corman and Escalona (1969) found that Stage VI was more variable in length and generally longer than any of the other stages. The accomplishments attained during this period are extensive.

With respect to object permanence, at Stage V the child could find hidden objects only if he watched their placement in the hiding place. However, Stage VI abilities allow solution of the following task. The object is first hidden in the experimenter's hand, the hand is moved under a cloth and emerges, still closed, and is then shown to the child empty. He must infer that the object is left under the cloth. This requires the Stage VI ability to imagine (construct an image of) various loci for an object permanently existing in space. Werner and Kaplan (1963) discussed the importance of the child's forming objects of contemplation as a precondition for symbolic language behavior. An object which the child can imagine at various loci has become an object of contemplation. This progress toward mental representation is reflected in three new imitative behaviors at Stage VI: (a) immediate imitation of complex new models, (b) deferred imitation, and (c) imitation of material objects resulting in mental representation.

Immediate imitation of gestures or sounds not

experienced before indicates the ability to rearrange behavior mentally, before performance. The child capable of mental representation constructs an internal image of the perceived model. Therefore, the trial-and-error aspect of finding new solutions to simple problems is not always apparent, because some problems can be solved without external experimentation. When Lucienne, Piaget's daughter, pushed her doll carriage to the end of the room, she turned and pulled, walking backward. Since this was not a convenient position, she paused and, without hesitation, went to the other side to push the carriage again. She found the procedure in one attempt.

Similarly, with respect to vocal imitation, the child precedes his external vocal reponse with an internal response based on his perception of the model. Thus he can immediately imitate with accuracy models similar, but not identical to, behavior in his non-imitated repertoire. Imitation can also be deferred and produced at a later time.

Deferred imitation refers to a response that follows a model and preserves some aspect of the modeled behavior, but is removed in time from the model. With deferred imitation the child will begin, for the first time, to produce new words which are not immediate imitations of an adult presentation of the word. Gestures

and actions which are imitations of another may be reproduced in the same way. As examples of deferred imitation in language, Piaget (1962) described a child at 16 months saying "in step" as she was walking, although she had not said it before and had no immediate model. At the same age, she pointed to her mother's nose and said "nose" using the word for the first time without hearing it immediately before. Piaget's comment on deferred vocal imitation is worth quoting in full, since it is a rare reference in his writings to mechanisms in language development:

> Subsequently, this phenomenon naturally becomes more and more frequent. The child tends less and less to use for the first time a word or group of words when he has just heard them. What was important from our point of view was to note the beginnings of this type of vocal imitation and relate it to the previous observations [p. 63].

Children at Stage VI use gestures and sounds which are imitations of objects. This type of imitation has been considered a problem-solving strategy. Piaget sees the child imitating objects as serving the same role that mental representation will later serve. For example, when Piaget's child tried to open a box, he first imitated the opening and closing motion with hand and mouth. Then he was able to arrive at a solution for opening the box. When he later became capable of mental representation, such behavior became unnecessary and dropped out of the

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repertoire, since he could then mentally represent the solution.

Imitation has been shown to evolve from early relationships with objects (Werner & Kaplan, 1963), become selective in its occurrence, and useful as a problem-solving strategy (Piaget, 1962). Piaget further suggests that imitation becomes internal and is the image when representation first begins. When considering the function of external vocal imitation in this framework, its selective use and value as a problem-solving strategy must be considered. It is also necessary to consider why a child with the capacity for mental representation should continue to imitate externally.

Although the child at Stage VI shows the capacity for mental representation, there is no reason to assume that he has perfected the ability to use this skill, or that it had evolved to its final form. At Sensorimotor Stage VI, language is just beginning. It begins in primitive form (single words) and evolves during the following year or so into conventional syntactic language. Brown (1973) suggested that progress at the end of the sensorimotor period is important for this evolution. If language is part of a general symbolic function, a non-linguistic measure of symbolic development beyond Sensorimotor Stage VI would be useful for comparing language development to

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other aspects of symbolic development. Piaget (1962) presents the development of symbolic play as a way of judging growth in mental representation at this time.

Symbolic Development According to Piaget: Symbolism in Play

In attempting to distinguish levels of non-linguistic representation ability beyond object permanence, play analysis would appear to be a logical place to start. Play is a natural activity of children during the second year. Piaget (1962) divides the child's activities during the early period of representation into two categories--intelligent activity and play. Intelligent activity refers to situations where the child acts in ways that further his understanding of the world. Play refers to activities done merely for the pleasure they bring. The notion that certain types of play reflect representational levels is suggested in the theoretical literature (Bruner, Olver, & Greenfield, 1966; Piaget, 1962). The levels of play described by Piaget are derived from the relationship between the child, and objects and people in the environment.

Enactive representation. Prior to the development of representation, the child begins to show his understanding of objects in the environment through actions, showing he understands their use. According to Sinclair (1970),

the appropriate use of objects is an important precursor of later symbolic play. She noted that the child does not use an object symbolically (as part of a game or to represent something else) until he understands its meaning in reality.

Escalona (1973) referred to Bruner et al. (1966) in discussing this behavior which she called "action naming." Some examples follow: (1) The child picks up a comb, touches it to his hair, drops it. (2) The child picks up the telephone receiver, puts it into a ritual conversational position, sets it aside. (3) The child gives the mop a couple of swishes along the floor. (4) Finding a cup, the child briefly puts it to his lips and sets it aside. It is apparent that the child is recognizing these objects through bodily action.

Piaget does not emphasize this aspect of interpretation, but sees this as a transition from practice for adult activities with real objects to symbolic play. Werner and Kaplan (1963) provide a highly detailed framework for symbolic development which includes an enactive phase. This is the type of behavior that forms the basis for later symbolic play which first appears toward the end of the sixth sensorimotor stage.

Symbolic schema. Symbolic play at Sensorimotor Stage VI is in the form of the symbolic schema which

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involves a fusion of the symbol with what it represents. The child pretends at his own activities, using sensorimotor schemas as symbols. These activities are symbolic in the sense that they are not done for the usual reasons, but only in fun, and that they are deferred in time from previous realistic occurrences on which they are based. Examples include the child pretending to eat or sleep, etc. Sometimes objects are used such as when the child pretends to eat with an empty spoon; sometimes not, as when the child pretends to sleep. However, the object itself is not a symbol. It is the child's actions simulating eating, sleep, etc., that are symbolic.

The distinction between this type of pretense and the enactive representation described above is that here the behavior is extended in time, the child appears to concentrate on the activity and gives some evidence of awareness that he is playing a pretend game.

Beyond the symbolic schema, Piaget (1962) suggested several stages in the development of symbolic games. For the purpose of charting the development of the symbolic function during language acquisition, only Stage I will be considered here. Stage I develops during the second and third year of life. Symbolic levels beyond this are identified chiefly by language behavior, and language has developed extensively by that time.

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Symbolic Stage I. Stage I is divided into several levels which evolve successively as symbolic development progresses. Stage I, Level I, involves the child using other toys to playact schemas he previously used as symbolic schemas (e.g., feeding the doll with the spoon), or the child playacting schemas derived from other persons or objects he has observed in the environment (e.g., pretending to iron a cloth). Stage I, Level II, involves similar behavior, but a greater dissociation between symbolizer and symbolized which is shown by the child announcing that one object represents another, or using his body to represent another person or object. Level III involves simple combinations of pretend schemata organized into sequences. This indicates even greater mobility of symbols because the symbols can now be combined, recombined, and evolved in various ways to suit the child's needs. These levels, as applied in this study, are fully described in Chapter II.

In studying play behavior of children between 12 and 26 months of age, Sinclair (1970) reported a developmental sequence in the children's actions with a standard group of play objects, presented to them for a 15-minute observation period, which corresponds to the levels of representation described by Piaget. The various levels of symbolic play were found to proceed according to

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theoretical expectations, culminating in play which consisted in organized series of actions.

As the child progresses through various levels of symbolic play, his language, too, is evolving. Many symbolic play acts are imitative, derived from the behavior of others. Imitation has been described as playing an important role in the development of mental representation. Vocal imitation of words in the linguistic environment continues as a form of verbal behavior during language acquisition for many children. Its role in language development has been a subject of controversy and some investigation.

Vocal Imitation in Language Development

In the light of the role attributed to imitation in symbolic development, what role can be assigned to vocal imitation in language development? Piaget considers vocal imitation a learned and essential tool for acquiring language. It is only when imitation can be covert, implying the construction of an image, and deferred in time, implying the ability to retain or reconstruct such an image, that Piaget considers progress in language possible without overt imitation. The question remains: if imitation now has the possibility of being covert and deferred, why does it persist as an overt immediate response to adult conversation?

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In earlier behaviorist tradition, overt imitation was considered the primary tool in learning language. Bloom's (1973) study of her daughter, Allison, indicated that vocal imitation could not be considered essential to language production, since this child was observed to use a minimum amount of imitation. At most, 6% of her utterances were imitations. She did, however, acquire an adequate language system.

In the nativist position emerging with transformational grammar, imitation was largely a moot issue. Ervin (1964) studied imitations from this perspective and determined that they were not progressive, because imitated utterances were either equal to or less developed than non-imitated utterances, in terms of syntax. As a measure of syntax, she wrote grammars for the subjects based on word order.

Imitated utterances were compared to free utterances in their predictability from the child's grammar. Four of five subjects studied by Ervin had word order of imitative and spontaneous utterances equally predictable from the grammar. For the one child whose imitative utterances were not predictable, Ervin found that in terms of sentence length, grammatical markers, and adult-like constructions, imitations overall were less mature than were free utterances. However, imitations could be

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progressive without being longer or including more grammatical markers and adult-like constructions than are observable in the child's non-imitated utterances. Those imitated need only be different from those occurring spontaneously.

What Ervin failed to examine is whether some constructions in the imitated utterances were unique or infrequent with respect to the child's usual non-imitated repertoire. If this were indeed the case, imitation could be used selectively for dealing with language forms or content which are only partially known by the child. Such experiments by the child might be shorter and have fewer grammatical markers and adult-like constructions than spontaneous utterances.

A study by Smith (1970) supported the idea that an utterance in the environment is selected as a model for imitation if some aspect of that utterance is unfamiliar to the child. Smith was investigating the type of adult language most likely to be attended to by children whose own language was telegraphic. Commands were presented to the child which varied on a continuum from single words to well-formed adult sentences. She further varied the commands by presenting them with major words systematically replaced by nonsense words. Verbal responses of the children included spontaneous repetitions

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of the commands. These were most frequent after commands containing nonsense words. These imitations were interpreted as attempts to make sense out of unfamiliar words. The older children tended to repeat only the nonsense words. Smith suggested that imitations were used by her subjects as a technique for dealing with novelty.

Extrapolating from Piaget, one might say that the selection of models is based partly on the resemblance of the model to the child's own activity, and partly on the unfamiliarity of the model. This unfamiliarity makes it difficult to reproduce the word and may lead the child, who is capable of representation and might normally solve this problem internally, to experiment with external vocal reproduction.

Consideration of the general role of imitation in establishing a relationship between the external world and the child's internal representation leads to a rationale for continued vocal imitation during language development. Initial representations are internal imitations. Later these become independent of imitation. There is no reason to suppose that all language symbols are equally strong as representations from the moment the child constructs them. Rather, it is the repetition and integration of many acts of representation interacting with the surrounding social and non-social milieu that perfects the skill in general.

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Many early words may go through a similar extended history as marginal internal representations before they become facile tools for communication to be called up at will.

Initially one might expect a particular word to require an immediate external model to allow construction of an internal image from which external production could be constructed. Later the child could construct and produce such a word in response to relevant internal or external stimuli, rather than in response to an adult presentation of the word. According to Schlesinger (1971), each language act begins with an intention. The intention is usually unconscious, but is analogous to the experience of having something to say, but not being able to produce the words. The intention is not usually experienced because of the lightning speed with which it is translated into an utterance. If the child's representational competency is marginal with respect to certain words, these might require greater external support for translation from the intention to vocal expression.

In order to demonstrate imitation as a process instrumental in language progress, a first condition is that imitations should be selective. To the extent that the forms of language, selected for imitation, are randomly drawn from the language the child hears, it is impossible to assign imitation a progressive role. If,

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however, it is found that words new to the child are imitated more often than those he has been using for some time, it might be inferred that imitation is being used to practice lexical additions. One would then expect a shift in imitation away from one word to another new word as the first word becomes fully usable in the child's non-imitated language.

Bloom, Hood, and Lightbown (1973) investigated this problem. They defined as imitated any utterance within five utterances of a model which neither added to the model, nor changed it, except by deletion. They found that for two subjects whose percentage of imitated utterances remained high (above 15%), imitation was used in this way. When these children produced multi-word utterances, it was found that production of semantic-syntactic relations identified by the authors followed a similar trend, from predominantly imitated to predominantly free utterances as the categories developed. Bloom's subjects who imitated to a lesser extent did not exhibit the progressive properties in their imitated speech exhibited by subjects who imitated more extensively.

The role of the child's internal representation is most clearly demonstrated for vocal imitation where sentence repetition tasks have been used to investigate

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comprehension and production of grammatical structures in social dialects. Baratz (1969) presented sentences in black English and comparable sentences in standard English to speakers of both dialects for imitation. Regardless of the dialect of the sentence presented, speakers repeated the sentences using the equivalent syntactic forms available in their own dialect. This translation effect indicates that rather than relying on the stimulus as presented, imitations are based on perceptions that have been rearranged to suit the internal structure of the imitator. This is the same effect as that discussed by Werner and Kaplan where children imitate the sounds of objects with phonemes available in the language system to which they have been exposed. The selection process involved in imitation as demonstrated by Smith (1970) and Bloom et al. (1973) is further evidence that some processing of the model occurs prior to reproduction.

Research involving vocal imitation demonstrates that the role of imitation during language acquisition may be similar to that of imitation during the earlier period when mental representation was developing. Vocal imitations have been shown to be selective in both experimental and naturalistic studies. Although Ervin (1964) concluded that imitations were not progressive for the child learning syntax, Bloom et al. (1973), employing more refined

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techniques of analysis, found that for highly imitative children, imitation was a strategy for progress. These studies effectively demonstrate that imitations are selective, that they involve models only partly understood by the child, and that some processing precedes reproduction of a model.

Language has been considered as a form of behavior dependent upon the underlying cognitive process of mental representation. The role of imitation in the development of language has been discussed. In the following section, consideration will be given to child utterances which reflect a basic differentiation in thinking defined by Piaget (1969).

Cognitive Aspects of Early Language

When Vygotsky (1962) stated that "thought and speech have different genetic roots [p. 4]," it is clear in context that he referred to the phonetic aspects, release function and social function of speech, rather than its symbolic properties. Piaget emphasized as well that the earliest words are not symbolic in the sense of later language. Vygotsky noted that "progress in thought and progress in speech are not parallel. Their two growth curves cross, and recross [p. 33]."

The attempt to understand the relationship between cognitive development and the earliest stages of

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recognizable language is made extremely difficult by the complexity of this interrelationship. While one can discuss the separate roots of speech and thought, they are not neatly separable in the naturalistic behavior of one- and two-year-olds. However, children at this age are poor candidates for experimental tasks which might help separate these variables. Inferences about the cognitive aspects of early language must be made by viewing the child's stream of verbal and nonverbal behavior from a perspective based on theoretically significant relationships, while maintaining an understanding of the child's perspective and awareness. During the sensorimotor period, the child organizes his world, making distinctions between things and actions based on his interaction with them.

Categories of Knowledge

Piaget (1969) discussed the distinction between figurative and operative cognitive functions. The figurative functions are perception, imitation, and mental imagery. The operative functions involve transformations from one state to another. The latter can refer to actions which transform things from one state to another or to intellectual operations which allow mental transformations to be contemplated. Logical mathematical structures are of this type.

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Knowledge of both types is derived from action on objects. The first type involves abstraction of object properties derived from such individual actions as throwing, pushing, touching, and rubbing. The second involves abstractions based on coordinated actions such as combining, setting up correspondence between objects, and ordering things in time and space by sequencing or classification.

As an example of this distinction, Piaget describes the experience of a mathemetician friend which first aroused his interest in mathematics. He was playing with some pebbles, arranging and rearranging them in different ways. For fun, he began to count the pebbles in each arrangement. He was amazed to find that whether they were in a straight line or a circle, no matter where he began to count, the sum of the pebbles was always 10. He was discovering the mathematical property of commutativity, that the sum is independent of the order. However, this property was not drawn from the pebbles themselves, but from the subject's organization of them. Previous actions with pebbles had led to the knowledge that they can be arranged without flowing together like water or being divisible into various numbers of parts like clay.

Piaget states that prior to language there is practical intelligence during the late sensorimotor period

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which is a logic of action. He includes at this time the beginnings of two essential characteristics of operations. First, a form of conservation is prefigured in the development of the concept of the permanent object. Second, spatial reversibility is exemplified by the child's understanding that a movement in one direction can be canceled out by a movement in the other.

Lezine (1971), in an unpublished report of longitudinal research involving 76 subjects, discussed developments in free play behavior in the preverbal period which demonstrate the roots of logico-mathematical structure.

> There is gradual establishment of relationship between his actions and the objects, between objects and between actions. Actions are progressively ordered in time and space, one action pattern can be imbedded in another, several action patterns can be coordinated one to the other. These general forms of coordination (order in movements, embedding of sub-patterns into a pattern establishing various types of correspondence) constitute for Piaget, the roots of logico-mathematical structures [p. 12].

Lezine went on to suggest that a period of experimentation of this sort precedes the development of the symbolic function. The development of the symbolic function through imitation, symbolic play, and the mental image prepares the way for linking verbal elements to reality.

It would seem likely that if a distinction exists for the child between figurative and operative knowledge, it might be reflected in early language. Bloom (1973),

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studying language from a linguistic perspective, identified a class of utterances in the single word period which apparently corresponds to operative knowledge. Sinclair (1970), in attempting to expand cognitive theory into the area of linguistics, suggested a similar classification of single-word utterances into two basic classes. Implications for the acquisition of syntax should follow from this distinction.

Earliest Word Classes in Infant Language

Part of the fascination with a baby's first words has probably been the apparent discontinuity from earlier, equally observable milestones. In a parent's eyes, these include the first tooth, beginning to crawl, feeding himself, standing, walking while holding on, and the first step taken all alone. Babies' first words and their dates of occurrence are recorded in baby books along with dates and anecdotes regarding these other milestones. To parents and linguists alike, learning words has stood out as a unique accomplishment, so apparently different from other early behavior that innate linguistic theories were dominant for a number of years in the 1960's for explaining language acquisition.

The effort in recent research to place language development within the framework of prior infant accomplishments began as a reaction to the innatist position

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that children possessed linguistic knowledge before beginning to speak (Chomsky, 1965). Theoretical impetus for this effort has come from theorists such as Schlesinger (1971) and Fillmore (1968) who presented suggestions for considering language from a more meaning-oriented approach.

Bloom (1973) suggested a way of relating early utterances to prior cognitive knowledge by describing different types of words used by her daughter during the one-word period. Bloom effectively demonstrated that the period of a single-word speech cannot be considered as unitary; development occurs within this period, and prior to the onset of multi-word utterances. Bloom further suggested that the language children do exhibit during this early period is related to their prior and developing knowledge about the world around them.

Bloom (1973) observed that children's single-word utterances could be described as belonging to one of two categories, based on the type of experience in reality that the word is used to code. Bloom considers the development of these two categories (substantive and functional) in relation to experiences as a primary linguistic induction made by the child prior to syntactic speech. Substantive forms are those that refer to "classes of objects and events that are discriminated

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on the basis of their perceptual features or attributes, and function or relational forms make reference across such perceptually distinguished objects and events [p. 67]." Person names and names of objects are common examples of substantive forms. Function forms, rather than referring to a particular "thing" or class of things, make reference to another category of phenomenon in experience. Early function forms reported by Bloom in her daughter Allison's speech were: "there," "uh oh," "no," "away," "gone," "stop," and "more." Her description of the use of "more" provides a good illustration of the kind of phenomenon that can be referred to by a function form.

> The word "more" was first used by Allison when she was sixteen months old and occurred in a situation in which she had frequently heard the word--during a meal, to request a second portion of food, after she had already eaten a first portion. On the day after she had first used "more" to request the recurrence of food, she used the word to request her baby sitter to tickle her again, after having been tickled just previously. Subsequently "more" also referred to another instance of an object in the presence of the original object; for example, Allison pointed to one shoe, commented "shoe," and then pointed to the second shoe and commented "more" [Bloom, 1973, p. 71].

One can see that function words refer to classes of events, but that the classes are determined more by relationships perceived in the environment than by attributes of objects or referents.

Sinclair related this distinction in language to the distinction between figurative and operative knowledge.

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However, the type of word called "substantive" by Bloom is considered a "denomination" by Sinclair. The type Bloom terms a "function form" Sinclair discusses as an "action-judgment." Examples of action-judgments make it clear that Sinclair discusses the same phenomenon as Bloom. Sinclair (1970) reported that "até" (corresponding to "par terre"--"on the floor"--said when something has fallen down) and "aplu" (corresponding to part of the sentence "il n'y en a plus"--"all gone") are typical examples of action-judgments.

Sinclair (1970) suggested that the action-judgments are linked to the organizing activity of the child (operative knowledge) and speculated that they "are the beginnings of what will develop into a rule governed grammar [p. 125]." For the purposes of this research, words of this relational type described by Bloom (1973) as "function forms" and Sinclair (1970) as "action-judgments" will be referred to as action-judgments. This is to avoid confusion with the more general meaning of the term functor in linguistics literature.

There is, then, the suggestion that by the time they begin speaking, children's knowledge has evolved in the dual way suggested by Piaget (1969) into figurative and operative types, and that early verbalizations express these two kinds of child knowledge, action-judgments

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referring to operative knowledge and substantives expressing figurative knowledge.

Syntactic knowledge is of the operative type. There is no reason to suppose that knowledge of the relationships between perceptual-conceptual objects arises full blown when it is expressed syntactically. It seems plausible that early observations of relationships, such as these, should be expressed by single words referring to a fusion of what will later be separable perceptual-conceptual objects with cognitively and syntactically specifiable relations between them. In this sense, "more" said when a food has been finished and another serving desired can represent an undifferentiated fusion of the empty dish, available food, a person capable of providing food, the speaker, and the prior assumption that the dish was previously full. The relational nature of what might be represented by this single word is apparent. However, it is not syntactic knowledge at this point. When all of these relationships are known to the child and syntactically expressed, it is obvious that the meaning would be based on operative knowledge rather than figurative knowledge. The order implied by syntax does not exist in objects or words, but in their relationships as constructed by the subject.

In the sense that a word makes reference to a

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fusion of these relationships in the environment, it would seem more accurate to place the learning of that word in the realm of operative rather than figurative knowledge. The substantives which gradually acquire features and become equivalent to adult concepts of objects and observable actions such as "ball," "roll," and "water" mentioned by Sinclair partake more fully of figurative knowledge derived from specific actions. This would include adult verb forms such as sit, jump, ride, etc., experienced by the child, which refer to specific actions.

The type of reference suggested for action-judgment would be naturally self-limiting. A small number of such words would be expected to be learned by the child, and they would be limited to the period of time when they are useful, that is, before he learns syntax. A single action-judgment can be expanded in reference by the child to describe a variety of events which would be distinct to the adult. This would be a special case of the generally noted phenomenon that the field of reference for a word is not necessarily the same for child and adult. This type of over-extension is based on the child's organizing criteria, rather than features of objects which can be pointed out by an adult.

As the child makes the induction that words can be combined, the need to develop new action-judgments or

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expand the reference of early ones would not be present. The suggestion is that action-judgments are primitives for the specialized form of operative knowledge called syntax. This distinction between figurative knowledge and operative knowledge arises from the earliest schemas and extends throughout development. The operative activity becomes hierarchical and progresses through the basic stages described by Piaget, culminating in logical-mathematical operations. Figurative knowledge interacts with, contributes to, and is acted upon by operations. However, there is no logical limit to its depth and breadth, just as it is known that vocabulary continues to increase throughout life as long as persons are exposed to new experiences. As people continue to enter new fields, physical knowledge can continue to increase. In a sense, this may be analogous to the logically closed aspects of syntax, and the relatively infinite opportunities for expressing increased semantic knowledge through an expanded and refined lexicon.

Thus it seems logically possible to distinguish word classes during the single-word period which are related to the prior and developing cognitive structures of the child and perhaps analogous to the later complementary roles of lexicon and syntactic structure.

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Summary

This review has traced the development of symbolic representation from imitation. An analogous role in language learning has been proposed for imitation. A distinction has been indicated between two categories of knowledge (figurative and operative) and between corresponding classes of words (substantives and action-judgments). It has further been suggested that the action-judgments are precursors of later syntactic utterances.

The purpose of this research was to investigate temporal sequences of development of each of these variables to determine the relationships between them. This research was intended as mainly descriptive and exploratory in nature. The complexity of the constructs described above and the necessity for making inferences about abstract processes from overt naturalistic behavior occurring over an extended period of development necessitated a small sample size. This, in turn, limits the generality of the results.

Several hypotheses were proposed with respect to these variables. They are summarized here and formally stated in the following section. Progress in symbolic play was expected to follow the sequence suggested by Piaget (1962). Imitative language was expected to be

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selective and progressive for all subjects in the development of lexical items and the establishment of multi-word utterances.

It was anticipated that some words would be identifiable as action-judgments and that their distribution in the children's behavior would change with time. Since imitation is considered by Piaget to be a process of figurative knowledge, and action-judgments code operative knowledge, it was expected that these words would occur infrequently as imitations.

With respect to symbolic level, it was hypothesized that variation in imitation, in number of different action-judgments produced, and in number of different multi-word utterances produced would be related to symbolic level.

Hypotheses Investigated

Symbolic Development

1. Children progress through the levels of symbolic play in the order described by Piaget (1962).

Imitative Language

2A. Consistency and extent of imitation. Children change over time in the extent of their vocal imitation. Children differ in the extent to which they imitate.

2B. Selective properties of imitation. In any

given language sample, word types are more likely to be used only imitatively or only spontaneously rather than having both spontaneous and imitative occurrences in the same session.

2C. Progressive properties of imitation. Words which are imitated in earlier sessions are used spontaneously in later sessions.

2D. Imitation of multi-word utterances. When children begin using multi-word utterances, these are more likely to be imitative than single words occurring at the same time.

Action-Judgments

3. Imitation of action-judgments. Action-judgments are imitated to a lesser extent than other utterances produced by the child.

The Relationship of Symbolic Development to the Language Variables

4A. Symbolic development and imitation. The proportion of the child's utterances which are imitations is a function of symbolic development.

4B. Symbolic development and the development of action-judgments. The number of different action-judgments used varies with symbolic level.

4C. Symbolic development and the development of multi-word utterances. Some consistent minimum symbolic

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level is attained when children begin (a) combining words and (b) when multi-word utterances come to predominate in their language.

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CHAPTER II

PROCEDURES

Subjects

Subjects were five white female children ranging in age from 14 to 18 months at the time the study began. Table 1 shows ages of the subjects at the observation times. Socioeconomic class was judged to be middle class on the basis of parents' education, occupation, and the geographical areas where they lived. All parents had completed high school and some post-high school education. Three mothers and four fathers were college graduates. Meri's parents were both engaged in part-time graduate work, and Tracy's father was a full-time doctoral student. All parents who worked were engaged in professional occupations. Tracy's family lived in the student housing at Rutgers University. The other subjects lived in suburban areas within one-half hour's drive from Rutgers University, New Brunswick, New Jersey.

None of the subjects had younger siblings. Janis, Meri, and Tracy were first born, Shanti was second born, and Mira third born. In the latter cases, the older siblings attended school which allowed for a somewhat

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TABLE 1

WORD TYPES, TOKENS, AND MEAN LENGTH OF UTTERANCE (MLU)
IN EACH LANGUAGE SAMPLE

Child	Session	Age (months and weeks)	MLU	Total single types	Action-judgment types	Total multi-word types	Total tokens	Total types	Type/token
Shanti	I	14,1	1.0	10	0	0	78	10	.13
	II	15,1	1.0	11	1	0	46	11	.24
	III	16,1	1.0	32	5	0	122	32	.26
	IV	17,2	1.0	27	6	1	103	28	.27
	V	18,1	1.06	36	4	0	114	36	.32
	VI	19	1.0	33	5	4	108	37	.34
	VII	20	1.09	63	6	18	333	81	.24
	VIII[a]	21	1.49	71	8	95	390	166	.43
	IX	22	1.72	65	7	109	439	174	.40
	X	23	1.74	69	7	120	460	189	.41
	XI	24	1.84	75	5	134	384	209	.54
Janis	I	15,3	1.0	11	2	0	23	11	.48
	II	16,3	1.0	17	5	0	52	17	.33
	III	18	1.14	21	3	8	78	29	.37
	IV	18,2	1.13	35	4	7	88	42	.48
	V	19,2	1.14	27	2	5	92	32	.35
	VI	20,2	1.19	37	6	5	93	42	.45
	VII	21,2	1.47	86	5	103	424[b]	189	.45
	VIII[a]	23	1.89	63	7	111	317	174	.55

(continued)

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TABLE 1 (continued)

Child	Session	Age (months and weeks)	MLU	Total single types	Action-judgment types	Total multi-word types	Total tokens	Total types	Type/token
Meri	I	15	1.00	13	1	0	33	13	.39
	II	16	1.02	25	2	1	91	26	.29
	III	16,3	1.02	36	3	1	120	37	.31
	IV	17,3	1.07	32	4	5	83	37	.45
	V	18,2	1.03	71	5	3	171	74	.43
	VI	19,3	1.17	70	5	29	296	99	.33
	VII[a]	21	1.54	74	6	97	372	171	.46
Mira	I	15	1.0	4	2	0	10	4	.40
	II	16,1	1.0	26	5	0	71	26	.37
	III	17,1	1.05	42	5	4	146	46	.32
	IV	18	1.07	44	5	13	417[c]	57	.14
	V	19	1.03	30	5	3	149	33	.22
	VI	20,1	1.15	62	5	30	310	92	.30
	VII	21,1	1.62	55	5	104	384	159	.41
	VIII[a]	22,11	1.80	46	2	120	309	166	.54
Tracy	I	19	1.06	15	3	2	35	17	.49
	II	20	1.02	12	6	1	41	13	.32
	III	21,2	1.03	24	6	2	114[b]	26	.23
	IV	22,2	1.02	34	7	2	124	36	.29
	V	23,2	1.04	28	4	3	74	31	.42
	VI	24,2	1.11	30	5	7	89	37	.42
	VII	25	1.14	23	4	5	50	28	.56

(continued)

TABLE 1 (continued)

Child	Session	Age (months and weeks)	MLU	Total single types	Action-judgment types	Total multi-word types	Total tokens	Total types	Type/token
Tracy	VIII	26	1.19	64	8	36	301	100	.33
	IX	26,3	1.31	57	7	38	218	95	.44
	X[a]	27,3	1.31	65	8	67	318	133	.42

[a]This is the first session where 25% of all utterance tokens were non-imitated multi-word utterances.

[b]These sessions were one hour long rather than 40 minutes.

[c]This total includes 180 instances of "mommy."

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comparable opportunity for one-to-one interaction between mother and infant across subjects during the school day at least. Mothers were primary caretakers of the infants for the duration of the study except for Shanti and Tracy. Shanti's mother engaged a babysitter four days per week for the last four months of the study. There was no visible trauma associated with this change and the quality of mother-child interaction as observed in the study did not appear to change. Tracy's mother did substitute teaching for the fifth and sixth months of the study. She reported that Tracy seemed to speak less at this time and the videotaped observations confirm this.

The subjects were selected in the following way. Four subjects who had been volunteered for an unrelated laboratory experiment one year earlier were contacted again and their mothers were asked if they would like to participate with their children in a longitudinal study of language development. Shanti's mother, a personal friend of the investigator, also volunteered to participate. Since it was necessary to complete data collection within one year, subjects who had begun to use some single-word utterances were required. Mother's reports of verbal repertoire of each child ranged from 7 to 25 words at the time the study began.

Data Collection

The data analyzed in this study were derived from videotaped samples of child language and play collected in the home at monthly intervals. Each visit lasted approximately two hours. During the first several visits, the experimenter administered the Albert Einstein Scales of Sensorimotor Development, Object Scale. Since it had been established that all subjects had achieved the sixth sensorimotor stage on several successive administrations, this procedure was discontinued. The scales are described in detail by Corman and Escalona (1969). The procedure involved requiring the child to search for small toys and edibles in increasingly complex hiding procedures.

After the scales had been administered, a language and free play session involving the mother and the child was videotaped. The mother sat on the floor and a standard set of toys was placed near her. Mothers were instructed not to try and direct the child's play or choice of objects, but to respond as naturally as possible to the child. Table 2 is a list of toys used in the study.

Mothers were asked to keep notes on their children's vocabulary development and word combinations. These notes along with such anecdotal information as new play interests, recent incidents, etc., were collected at

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TABLE 2

TOY LIST

Toy iron
Blue sponge
Toy mop
Child's purse
Metal teaspoon
Plastic toy telephone
Comb, 8" long
Wooden rattle ball
Round wooden beads
Toy mirror and comb

Toy metal coffee pot with lid
Toy metal cup and plate
Stuffed brown leather dog, 7" long
Toy baby bottle and nipple
Yellow scrub brush, with handle
White plastic baby bottle cover
Yellow cotton cloth, about 6" square

"Oscar" finger puppet (green)
Grover finger puppet (blue)
Orange rubber elf, 4" high
Wooden dump truck, 2-3/4" long
White plastic toy eyeglasses
Plastic multicolored pop beads
White slip-on scuffs, adult size 6

Slide open cardboard pill box, 2-1/2" long
Playskool building cups--6 cups of various colors
Small Fisher Price car and removable person
Plastic red and yellow dump truck, 12" long
Walt Disney Dumbo Pushbutton Pop Pal (elephant jack-in-the-box)

Book Baby's Things, Platt & Mink Co., Inc., 1966.

Book Pat the Bunny by Dorothy Kunhardt, Western Publishing Co., Inc., Racine, Wisconsin, n.d.

Baby doll, 9" tall, with removable blanket, shirt, panties, hat; eyes open and close.

Little girl doll, 9" tall, blond hair, with removable shoes, shirt, skirt, panties.

Playskool Puzzle #156 25 with four pieces, including cow, butter, ice cream, milk, picture of glass.

Plastic toy tool box with hook lock; inside are orange hammer, pink wrench, green wrench, blue screw driver, red peg, green screw, pink screw.

Clear plastic milk bottle with yellow top and plastic foods: 3 bottles (orange, white, red), banana, corn, carrot, grapes, dressed turkey, butter, lemon, green fish, purple fish.

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the monthly visits.

These visits continued for approximately one year. Data included in this analysis are only those from the period of early recognizable vocalizations to the time when multi-word non-imitated utterances comprised at least 25% of the child's utterances in a given session. For one subject, Shanti, three subsequent visits were included.

Transcription of Data and Development of Criteria for Categorization

In order to have a written record of the video-taped sessions, which could be used for language and play analysis, it was necessary to transcribe the mother and child language with accompanying contextual information. The method suggested by Bloom (1970) was used. Before categories of play could be judged, certain preliminary steps had to be accomplished. Piaget's (1962) criteria for the levels of play described in Chapter I were vague. Several months of work with pilot data were required before criteria were specified which could reliably distinguish the levels of play. Since all children had achieved Sensorimotor Stage VI object permanence when the study began, the scales could not be used for comparisons with subsequent language development. Play was the only non-language measure of representation which continued for the duration of the study.

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Data Preparation for Play Analysis

Each transcript of play behavior descriptions derived from the videotapes was divided into episodes determined by the child's involvement with the toys. An episode began when the child took some action indicating involvement with a toy. The act of picking up an object and immediately putting it down or handing it to the mother was not sufficient to determine an episode. An episode ended when the child set the toy aside. The next episode began immediately at the end of the preceding one and might include the next several peripheral object contacts as the child made the transition from one involvement to the next. Occasionally additional objects were added to the first object with which contact was sustained in an episode. Should the focus shift to a second object after including both simultaneously, the episode would continue until both the first and second objects were set aside. For example, the child might set out the nesting cups, then place small objects from the dumping bottle in them, then spill the objects back into the bottle from the cups and proceed to dump them, and replace them. No segmentation would be indicated here between play with the nested cups and the dumping bottle.

Reliability was not established for this aspect of data preparation. The two investigators who did play

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coding segmented some transcripts separately, then compared and settled disagreements prior to play coding. Other transcripts were segmented by one investigator and then coded by each separately as part of a reliability assessment of play coding. Division into episodes was readily agreed upon using the general rules stated. Further specification of criteria would probably be needed for reliable segmentation by independent judges.

Assignment of Symbolic Level

Each episode was then judged according to criteria derived from Piaget (1962) as indicating particular levels of symbolic development. Several symbolic activities might occur in a given episode. For purposes of determining the child's maximum level of performance, the episode was coded in accordance with the most advanced symbolic activity observed within the defined bounds of that episode.

The following discussion presents the system of analysis as it was derived from Piaget. It became apparent that in order to use play analysis as a tool for charting symbolic development during the second year of life, a finer breakdown of symbolic Stage I than that provided by Piaget would be needed. The levels eventually used are summarized in Table 3 and described below.

Level 1: Enactive representation. If the child showed by a brief gesture that he understood the meaning

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TABLE 3

SEQUENCE OF SYMBOLIC LEVELS ACCORDING TO PIAGET, AND AS THEY ARE APPLIED IN THIS RESEARCH

Piaget (1962)	Levels applied in this research.
Prior to Sensorimotor Stage VI	(1) Enactive Representation: The child shows understanding of object use or meaning by gestures.
Sensorimotor Stage VI	(2) Symbolic Schema: Child pretends at his own usual activities such as eating, sleeping, grooming.
Symbolic Stage I	(3) Single Schema Symbolic Games:
Type IA	Type A, Assimilative: Child has other objects or people take his normal role in pretend activities such as eating, sleeping, grooming.
Type IB	Type B, Imitative: Child pretends at activities of other people, such as dogs, trucks, trains, etc.
	(4) Primitive Single-Schema Combinations: The child plays at only one action, such as eating, but expands it to various objects or people, i.e., eating various foods or feeding dolls and people.
	(5) Primitive Multi-Schema Combinations: Child plays at several actions, i.e., grooming the doll, rocking it, feeding it, etc., but there are no planned elements, and the sequence is not realistic.
Symbolic Stage I	(6) Planned Single-Schema Symbolic Acts: Transitional Type: Activities from Level 1 that are planned.
Type IIA	Type A: Symbolic identification of one object with another, such as toy iron = boat, comb = spoon, etc.
Type IIB	Type B: Symbolic identification of the child's body with some other person or object, i.e., pretending to be a cat, the mother, the mailman, etc.
Symbolic Stage I Type IIIA	(7) Combinations with Planned Elements: These include planned elements and tend toward realistic scenes.

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or use of an object, this was classified as an enactive representation. A common occasion for enactive activities in this study occurred when the child was exploring the toys and taking them out of the bucket. The child might, in quick succession, take out the comb, touch it to her hair, drop it, and reach for another toy. Occasionally several objects in succession were enactively recognized in this way. The toy iron, sponge, mop, comb, purse, telephone, scrub brush, beads, mirror, and glasses all elicited this type of object appropriate behavior.

At higher levels these activities were used symbolically, as the child extended the length of time she played with an object and gave evidence of pretending. When pretending was apparent, the activity was coded at a higher level than enactive representation. Evidence observed which suggested the child was pretending is described below. The symbolic schema is the lowest level of pretend play coded.

Level 2: Symbolic schema. If the child played at his own activity outside its usual context, this was classified as a symbolic schema. It might involve objects such as pretending to eat with a spoon, or using the comb or scrub brush for grooming activities. These cases were distinguished from enactive gestures by their extension in time as well as the presence of some evidence of pretending.

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Sound effects might accompany pretend eating here, and the child might occasionally smile or laugh with the mother as if pretending were a common joke they shared. It was occasionally difficult to distinguish the enactive gesture from the symbolic schema, but the difficulties were not insurmountable. Other instances, such as pretending to sleep, did not include objects. While these activities may appear diverse in the level of sophistication shown, all were suggested by Piaget as occurring at the sixth sensorimotor stage. They all occurred in early observations in this investigation. The common aspect across types of symbolic schema is pretense.

The symbolic aspect of play derives from the pretend nature of the activity since pretending implies symbolic substitution of play for reality. Assignment to a symbolic play level required evidence that the child was pretending. This decision required careful and conservative judgment of the child's observed actions and attitude during the episode. The child may treat toys as if they are real or animate. Actions may be suggested rather than completed, i.e., saying "by-by" but not going anywhere, and kissing the air rather than the mother before "leaving." The child may extend an empty hand to give something to the mother. An object may be used to represent something else after the child has exhibited

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knowledge of the actual use of that object. An object may be verbally identified to be something else.

Less preferred evidence involved judging the attitude of the child as playful rather than serious, or a pretending mode, rather than a handling or exploratory one. Here use of an odd "play voice," a coy smile, shaking the head to indicate unreality, or possible negative reaction from the mother as recorded on the videotape was useful.

Enactive representation and the symbolic schema are both behaviors that occur during the sensorimotor period. The types of symbolic play described below incorporate these earlier behaviors. These levels are considered by Piaget (1962) to be successive developments of the first symbolic stage, that is, beyond sensorimotor behavior. Piaget divides this stage into three levels. The present investigation identifies two additional levels within Piaget's Symbolic Stage I, Level I. An additional type of Symbolic Stage I, Level II, was also identified.

Level 3: Single schema symbolic games. At this level, play schemas are more dissociated from the child's body. Piaget divides behavior at this level into those activities where the child assimilates other people and objects to his own schemas (Type A) and those activities in which the child imitates the activity of other people

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and objects (Type B).

When the child applied his schemas such as those described above as symbolic schemas to other people or objects, this would be coded Type A. In this study, the child might pretend to feed the doll or the mother, instead of pretending to eat herself. The child might put the doll "night-night," or hug and kiss it as her parents have with her. In essence, she turned passive behavior into active, exhibiting what may be an early precursor of reversibility. These games were derived from the child's experience, often experiences with a caretaker. Although the child adopted the active caretaker role in these games, the role was quite primitive and always involved playing activities where the child was normally the focus. There was no reason to assume the child differentiated the active and passive here, actually becoming "caretaker" with respect to the doll or mother. The simplest interpretation was that she played at common occurrences in a global way.

In Type B activities the child accommodated her own body to the actions or sounds of other people or objects so this type of play was essentially imitative. Excluded from Type B were all of the activities included in the baby's own usual behavior and all of those typically involved in her daily life where she was a

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participant rather than an observer. Thus, all activities of the symbolic schema and IA types described above such as pretending to eat or feeding others would be excluded.

Activities commonly observed by the child are included here. The baby might pretend at cooking, ironing, or cleaning up, using the objects available. She might use the purse and pretend to be going out, or the telephone, holding it appropriately and saying "hi," "by," or mumbling some pre-verbal gibberish. These incidents were similar to those of the enactive phase in the use of the objects. However, extension over time and evidence of pretending were their distinguishing characteristics.

Level 4: Primitive single-schema combinations. Primitive single-schema combinations were those where one was repeated by the child with variations. The simplest of these was related to the earlier activities played at the enactive and symbolic schema levels. For example, the child would comb her own hair (symbolic schema) then comb the mother's and/or one of the doll's. Similarly, the child would drink from the bottle, then feed the doll or toy dog. The child might offer the mother a drink from the cup, then have a sip herself. Sometimes the sequence continued to include the investigator and camera-person. This was only a shade more advanced than IA and IB, but did involve reliably identified sequences of symbolic

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activities. The distinguishing characteristic was that only one schema or action was played. Its repetition and expansion was primitive, analogous to the circular reactions of the sensorimotor period, with the added aspect of the same means or schema used for different ends.

Level 5: Primitive multi-schema combinations. These episodes differed from the single-schema combinations in that a series of related actions occurred rather than only one schema. Doll play was the richest source of these. The doll was often kissed, put to bed, hugged, wrapped, dressed, etc., in sequences which could be repeated several times in a given episode. Telephone play was also frequent, involving such schemas as listening, dialing, and reporting snatches of conversation (occasionally unintelligibly). These incidents were, however, less advanced than incidents such as those described by Piaget as Levels I-III. The random nature of sequencing and lack of attempts to mime reality were essential differences. One could say that these situations were played without regard for the logic of conventional relationships between the parts which would become so important to the child at the higher levels. For example, the child at this level saw no contradiction in saying the doll was "night-night," then immediately putting the bottle or spoon to its mouth, presumably feeding a sleeping doll. At the higher level,

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feeding would precede "night-night" or some transition would occur such as picking the doll up, or saying "awake" as one subject did before feeding the doll who had been "night-night." One schema seemed to suggest a related one rather than the sequence being decided in advance and played in order.

Level 6: Planned single schema symbolic acts. This level parallels Piaget's Symbolic Stage I, Level II. In establishing criteria for this level, it became apparent that it was the child's pre-planning of the symbolic act before enacting it that was the distinguishing characteristic at this level. Piaget distinguished two types of activity here paralleling the types described at the previous level. It became apparent in analyzing videotaped play samples that in addition to the specific types described by Piaget, many of the other kinds of activities children had done at Levels 3 and 4 were later done with evidence of pre-planning. An additional type of play based on these activities was identified and included in this research. The three types included, at Level 6, two from Piaget and one first identified in this investigation, are described below.

In Type I-IIA (Piaget, 1962), there was symbolic identification of one object with another. The symbolized was the object the child had in mind and the symbolizer

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was both the action and the present object. If a child pretended a toy iron (with which she had often ironed) was a car and moved the iron along the floor the way she often did with a toy car, both the iron and movement were considered symbolizers, and the car the child evoked mentally was the symbolized. When the identification was verbally made prior to play, a planned aspect was evident.

When one object was used in place of another at this level, the identification often preceded the symbolic use. For example, one child said "grapes," reached for the necklace he was wearing moments before and "ate" it saying "num, num, num." Another said "hat" and took the doll shoe, recently removed from the doll, and put it on her head. Piaget (1962) stated that this prior verbal announcement "is the novelty of the situation [p. 126]." This indicates the intimate interdependency between play and language development.

In Type I-IIB (Piaget, 1962), the child "became" an object or another person. As in Type I-IB, imitative play is involved. He symbolically identifies his own body with that object or person. A child crawling about making animal sounds was characteristic. The verbal announcement of a role before the child began to play was a positive indicator of pre-planning.

Play belonging to the earlier categories (Levels 3

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and 4) were later pre-planned as the child developed. Since these kinds of planned activities occurred earlier than the types of behavior suggested by Piaget at this level, this may be a transitional form of play between earlier unplanned symbolic acts, and later behaviors such as those described above where the symbolic identification is clearly specified.

In this sample this type of behavior was more frequent than the types of behavior described by Piaget. This may be an artifact of data collection procedures. Both of Piaget's types at Level II are characterized by the child making some symbolic substitution for absent material. This is done by using one object to represent another or using the entire body as a symbolic object. It would not be surprising if, presented with a large variety of novel toys, many suited to pretend play, the child should make use of these items. It is important to note that most of the objects nad manipulative play possibilities as well as sybmolic. Children could easily have amused themselves with these objects without resort to symbolic activities at all. So while the procedures may have biased the data in the direction of object-related activities, there was no bias toward symbolic activities.

All activities judged to be at Level 6 involved the child planning the action in advance. Identifying

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evidence for pre-planning is described as follows.

Verbal announcing was the strongest indicator of pre-planning. This was often accomplished with a single-word announcement. It might take the form of an instruction to the mother to begin an activity, or an announcement of intention. For example, the child might pick up the doll bottle and say "feed" or "baby" before doing this action. Search could also indicate planned action. If the child located one object needed for a game, then engaged in direct search for the other things she needed, the assumption of pre-planning was made.

The speed of a child's action, following eye contact with objects to be used, might suggest that the child has planned the activity. This inferential evidence is less desirable than the more direct evidence above, and was not used in this study.

Level 7: Combinations with planned elements. The highest level of symbolic Stage I described by Piaget (1962) is Level III, symbolic combinations. The combinations included in Level 7 of this research are comparable to the earliest games considered by Piaget as his Level III play.

The distinguishing characteristics of activities coded at Level 7 were that more than one symbolic activity was included and that the game included at least one

planned element. During Level 7, the child's pretend activity began to be sequential in nature, to involve more than one object used symbolically, multiple schemata and multiple actors. This type developed in complexity from earlier behaviors. For example, at Level 4 the child might feed a sequence of actors. The child at Level 7 would first cook, perhaps stirring with a spoon or some substitute, and identify the food, then feed the mother and offer a second portion. Later these games became more extensive and a single game could provide a theme for a half-hour play session. One pilot subject built such a sequence around the "Oscar" finger puppet which was variously injured, consoled, fed, and put to bed twice in succession. The children commonly built such sequences in doll play at this level, typically inviting the mother to participate. This basic ability to play sequences of events is expected to develop broadly, serving various needs of the child. Simple games of this sort are derived from, and may be contemporaneous with, Level 6.

Reliability of play analysis. For reliability purposes, a judge was trained by the investigator in applying specific criteria for judging play levels (95% confidence interval = .811 - .887, point estimate = .850).

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Categorization of Imitative Language

As a preliminary step prior to analysis of the language data, utterances in each language sample were categorized with respect to imitativeness, utterance length, and the equivalence of various word forms. With respect to imitation, utterances were placed in categories described by Bloom (in press). An utterance which met the following criteria was considered an imitation: (a) it occurred in a naturalistic situation without the child being asked or prompted to imitate; (b) it repeated all or part of a preceding model; (c) it added nothing and changed the model, if at all, only by leaving something out; and (d) no more than five utterances from the child or others intervened after the model. This excluded cases where the mother requested that the child imitate and the child did.

Any utterance failing to meet one of these criteria was considered a non-imitation. Occasionally a child utterance which would be considered an imitation by the criteria listed above had been produced prior to the maternal utterance which appeared to serve as a model. In this case the child's original utterance was spontaneous, the mother imitated the child within five utterances, then the child repeated the original utterance within five utterances, appearing to imitate the mother. Child

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utterances of this type were considered spontaneous, rather than imitated, but were classified separately. When the mother requested that the child imitate and the child did, the utterance was considered imitation by request, and classified separately.

Children use some utterances as units which would include two or more adult words. These were counted as single-word utterances and written with the two parts run together (e.g., "allgone," "whatsat") or with a dash between them (e.g., "night-night"). When two or more versions of the same concept were used, each of the versions was coded as one form of the concept (e.g., "mommy" and "mama" both coded as mama, "chickie" and "chick" both coded as chick). Non-standard forms and/or pronunciations of words recorded on the transcript were coded according to their standard English spellings (e.g., "ope" was coded as "open"). Intelligible exclamatory and onomatopoetic utterances were coded with a consistent word name (e.g., "ah," "oh," "mmm," "huh," "umhm," "brmm").

Determination of Word Type

Action-judgments were defined in Chapter I as single words which refer to categories of phenomena which are distinguished on the basis of relationships observable in the environment rather than on the basis of perceptual features which are common to a class of objects or events.

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These words have theoretical significance for cognitive development in the one-word period. Sinclair (1970) indicated that these words are derived from the child's knowledge of operations rather than his knowledge of physical phenomena. It was suggested in Chapter I that these words are the single-word precursors of later syntactic utterances.

These words were identified and their distribution in the language samples analyzed. Some examples of how such words were used by a pilot subject, Will, are as follows:

"Open"

Comment on rubber elephant with head removed.
Trying to take apart stacking cups.
Comment about his shoe being off.
Undressing the doll, the doll undressed.

"Up"

As he stands up.
Request toys that are high and out of reach.
Pointing up and bouncing (apparently for fun).
Reaching up, standing on tiptoe.
Riding on mother's back.
Picking up an object that fell from the dump truck.
Moving body up and down as he operates his dump truck.

"Down"

Getting down from a chair.

Bending over to pick up something that fell.

These words were distinguished from other words used by the child by the following criteria derived from Bloom (1973).

1. The word occurred persistently over time, that is, in at least three sessions.

2. The word made specific reference to relations between objects, people, and happenings.

3. The word occurred in a variety of circumstances, with reference to different types of situations observed in the environment. (For example, if "more" were used only to request a second portion of food, rather than commenting on another instance of something and requesting continuation of an activity, its status with respect to criterion 2 would be suspect.)

The application of these criteria can be illustrated by considering the words used persistently by Will. These were "no," "open," "up," "down," "pacifier," "ball," "duck," and "eye." Each of the noun forms ("pacifier," "ball," "duck," "eye") was used in the presence of an appropriate object, showing, pointing to, requesting. These seem clearly substantive. "No," which has relational possibilities as discovered and used by Allison

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(Bloom, 1973), was always an answer to a question for Will. Incidentally, the "right answer" was occasionally "yes." Will was asked, "do you want a cookie?" He answered, "no," but ate several. So, for Will, there was no evidence that "no" referred to relations he perceived between possible referents in the environment. However, "ope," "up," and "down" were good candidates for the action-judgment category.

"No" used consistently only as a negative reply to a question would not fit the action-judgement category. However, if "no" were used in reference to an empty container, on occasions when the child tried something and failed, on occasions when unexpected things occurred together, such as a picture of a human body with a lion's head, there would be sufficient evidence that the child was designating a class of relations rather than responding to a verbal stimulus in a stereotyped way, or referring to objects or actions with similar physical properties.

Statistical Techniques for Analysis of the Data

The following is a presentation of the statistical techniques used to investigate the hypotheses. After appropriate categories for symbolic level, imitation, and word classes had been determined and applied, the sequence of development of each child with respect to these

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variables was investigated. Where appropriate, the relationships of these variables were analyzed. The language analysis employed the distinction between utterance types and utterance tokens. Utterance type refers to consideration of different words as the unit of analysis. "Ball" and "run" are both word types. If a child used only those words in a session, two types would have been used. However, "ball" may have been said three times and "run" twice. In this case, five tokens have been used. Token refers to individual of occurrences of word types.

Symbolic Development

Symbolic development was determined for all children at each session and their progress through the levels described was noted. Statistical analyses were performed to relate this progress to the linguistic variables.

Imitative Language

Consistency and extent of imitation. Techniques described by Bloom et al. (1973) were employed to determine the extent and consistency of imitation for each subject over the course of the study. This analysis was performed separately for each subject. For each sample time, the proportion of different utterances (types) that occurred only spontaneously, only imitatively, or both spontaneously and imitatively (Sp + I) was determined.

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A chi-square test was applied to determine whether there were any differences in the proportion of frequencies of elements appearing in each of these three categories from session to session. The proportion of different words in the imitated category was graphed by age so that comparisons could be made of the general form of this graph across children.

Two-way analysis of variance was performed to examine the relationship between children, symbolic levels, and extent of imitation.

Selective properties of imitation. For each child at each time period, a chi-square test was performed to determine whether different word types occurring in the session had the same proportion of occurrences as imitated and spontaneous utterances. If imitation were used selectively, these proportions should differ.

Progressive properties of imitation. If imitation were to be facilitative in lexical learning, it would be expected that particular words would be imitated in early sessions and spontaneous in later sessions. Procedures derived from Bloom et al. (1973) were employed to investigate this question. Each subject was evaluated separately.

Words were included in this analysis if there was some change in the proportion of their occurrences as

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imitated versus spontaneous utterances from one session to the next. For each such word, the Spearman Rank Order Correlation was calculated for its proportion of use as an imitation in a given session versus session number. A *t* test was performed on the set of Spearman Rank Order Correlations, with the null hypothesis that the mean correlation equaled zero.

Imitation of multi-word utterances. Mean length of utterance (MLU) was near 1.0 for all subjects when the project began. Since the production of multi-word utterances was a new and developing skill for these children, it was hypothesized that early multi-word utterances would be imitative to a greater extent than single words. This assumed that early combinations are derived from linguistic models of combinations in the environment.

To test this hypothesis, the proportion of multi-word imitated types, to total multi-word types, was compared to the proportion of single-word imitative types, to total single-word types, for each child at each session. The test used was the large sample *z* test of the equality of two proportions.

Action-Judgments

When action-judgments had been identified, the following procedure was followed to investigate their imitative occurrences. The proportion of imitated to total

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occurrences of action-judgment tokens was compared to the proportion of imitated to total occurrences of all other single-word tokens. A sign test was applied to determine whether these proportions tended to differ and the direction of their difference. This was performed with subjects pooled and for each subject separately.

CHAPTER III

RESULTS

The results will be presented with reference to the hypotheses listed at the end of Chapter I. Progress of the subjects through the seven symbolic play levels is described first. Then results of investigating the four hypotheses dealing with the role of vocal imitation in language development are presented. A description of the number and types of action-judgments used by the subjects follows. Finally, the relationship of symbolic play level to three language variables, imitation, use of action-judgments, and use of multi-word utterances, is described.

Symbolic Development

Hypothesis 1. Children progress through the levels of symbolic play in the order described by Piaget (1962).

The children did progress from Levels 1 to 7 of play in the order suggested by the theory (Figure 1). (Table 3 shows a brief description of these levels.) In some cases, more than one level was attained in the time intervening between visits. In particular, Levels 6 and 7 were reached together by each subject. Four subjects

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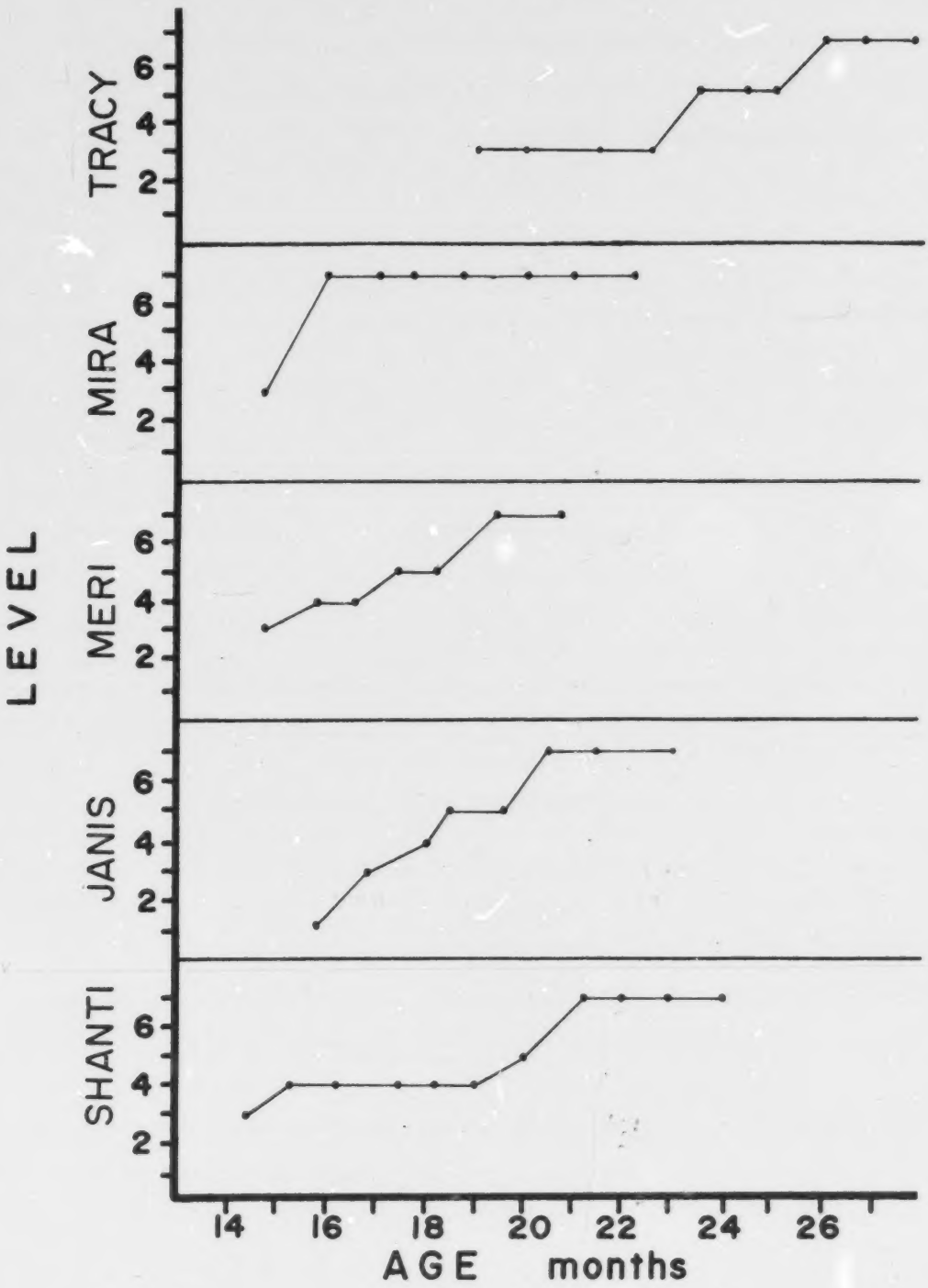

Figure 1. Age at attainment of symbolic play levels.

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exhibited Level 3 in their first session. Janis attained Level 3 at the second session. The times between attainment of Levels 3 and 7 for each subject, respectively, were as follows: Shanti, 7 months; Janis, 4 months; Meri, 5 months; Mira, 1 month; and Tracy, 7 months.

Imitative Language

Consistency and Extent of Imitation

Hypothesis 2A. Children change over time in the extent of their vocal imitation. Children differ in the extent to which they imitate.

Word types were the variable for analysis. In investigating changes in the extent of imitation, each subject was treated separately. Word types for each session were classified as suggested by Bloom (1973) into three categories: (a) imitated, those which occurred only as imitations; (b) spontaneous, those which occurred only spontaneously; and (c) both spontaneous and imitated (Sp + I), those which sometimes occurred in the session imitatively, sometimes spontaneously. For Shanti, Janis, Meri, and Tracy, the proportion of utterance types in each of the three categories varied across sessions (Table 4).

Shanti, Janis, Mira, and Tracy showed a somewhat similar pattern of change with respect to imitation. They began with a low porportion of imitation, which then increased steeply and subsequently declined (Figure 2).

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TABLE 4

PROPORTIONS OF SINGLE-WORD TYPES WHICH OCCURRED ONLY AS IMITATIONS

Session	Subject				
	Shanti	Janis	Meri	Mira	Tracy
I	0	.09	.46	0	.13
II	.36	.25	.28	.27	.08
III	.38	.05	.25	.14	.21
IV	.15	.23	.28	.09	.29
V	.14	.22	.35	.10	.25
VI	.33	.24	.10	.13	.17
VII	.13	.11	.07	.13	.04
VIII	.20	.00		.11	.09
IX	.06				.11
X	.07				.05
XI	.01				
χ^2	69.82	40.36	48.51	13.30	73.35
df	20	14	12	14	18
Significance level	>.001	>.001	>.001	>.50	>.001

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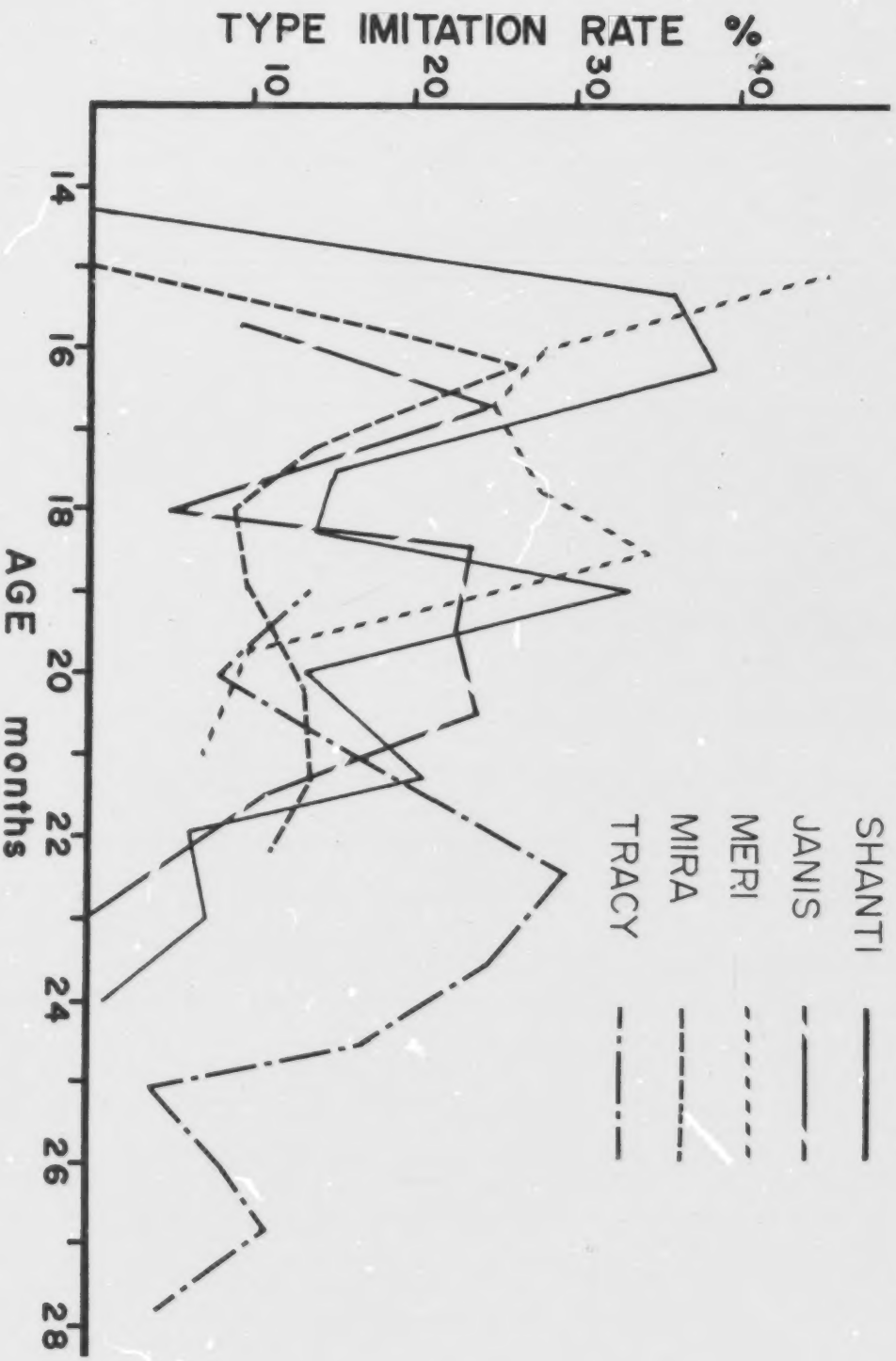

Figure 2. Proportion of word types imitated only.

Meri began with a high proportion of imitated types and then followed the pattern of subsequent decline.

Janis, at 18 months, had a low imitation rate which did not fit this general pattern. Notes made at the time of that visit indicated that she was visited four hours later than usual and was tired and listless. The low imitation rate may reflect the generally low activity level observed in this session.

Shanti exhibited an isolated high proportion of imitative utterance types at 19 months of age. There were no exceptional extralinguistic variables associated with that visit. Viewing imitation at this time in the context of prior and subsequent observation suggested that Shanti was undergoing a period of rapid progress in language development as described below.

During the previous session, at 18 months, Shanti's mother had first noticed that she imitated many words she did not produce spontaneously. During the 19 months' visit, the experimenter observed that Shanti was readily imitating words at her mother's suggestion. In the subsequent visit at 20 months, imitation had fallen to the previous level. However, this session documented an extreme leap forward in her linguistic performance.

During this session, Shanti produced three times as many utterance tokens as she had produced previously.

She also produced twice as many different word types as she had previously. During this session, Shanti produced 18 different multi-word combinations. Her previous maximum had been four.

When children were compared to one another in their extent of imitation, the results were complicated by variability in each child's imitative performance during the study. The children differed at the .05 level of significance (Table 5). However, the same two-way analysis of variance indicated that imitation varied with symbolic level across children (significant at the .005 level) and that the interaction of level with child approached significance (.06). The differences among children are, therefore, best interpreted when consideration is given to the effect of this interaction.

Selective Properties of Imitation

Hypothesis 2B. In any given language sample, word types are more likely to be used only imitatively or only spontaneously rather than having both spontaneous and imitative occurrences in the same session.

Examination of imitation rates for particular words (types) revealed that most words could be categorized as either imitated or spontaneous throughout a given session. Relatively few words occurred as both imitated and spontaneous utterances in the same session (Table 6).

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TABLE 5

ANALYSIS OF VARIANCE FOR SYMBOLIC LEVEL AND SUBJECTS WITH IMITATION RATE[a] AS RESPONSE VARIABLE

Source	df	Sum of squares	Mean square	F ratio	Significance level
Subject	4	802.6	200.6	2.60	.05
Level	2	1,173.7	586.9	2.61	.005
Level x subject	7	1,193.3	170.5	2.21	.06
Residual	30	2,314.6	77.2		
Total	43	5,484.2	127.5		

[a]Imitation rate is the proportion of word types which occur only as imitations.

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TABLE 6

COMPARISON OF NUMBER OF SINGLE-WORD TYPES IMITATED,[a] SPONTANEOUS,[b] AND BOTH SPONTANEOUS AND IMITATED (SP&I)[c]

	Spontaneous[a]	Imitated[b]	(SP&I)[c]	Total
Observed	1,368	268	135	1,771
Expected $\left(\frac{1,771}{3}\right)$	590.3	590.3	590.3	
χ^2 cell	1,024.6	176.0	351.2	
χ^2 total = 1,551.74		df = 2	$\alpha < .001$	
Observed		268	135	403
Expected $\left(\frac{403}{2}\right)$		201.5	201.5	
χ^2 cell		21.9	21.9	
χ^2 total = 43.90		df = 1	$\alpha < .001$	

[a]This category includes the number of word types which occurred only as spontaneous utterances in a given session, summed over all sessions.

[b]This category includes the number of word types which occurred only as imitations in a given session, summed over all sessions.

[c]This category includes the number of word types which occurred both as imitations and as spontaneous utterances in a given session, summed over all sessions.

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Figure 3 shows the frequency of words in the three categories, imitative, spontaneous, and both spontaneous and imitated (SP&I) for each child by session. Totals in each category for each session were summed over all sessions, and compared.

The chi-square test of independence revealed that the proportion of types in the three categories (imitated, spontaneous, and SP&I) differed at the .05 level of significance for all five children with totals from all sessions pooled. This result supported the hypothesis that imitation was used selectively by the subjects.

Progressive Properties of Imitation

Hypothesis 2C. Words which are imitated in early sessions are used spontaneously in later sessions.

This analysis was based on the proportion of imitative occurrence of individual word types. It included only words appearing in two or more sessions where their proportion of occurrence as imitations changed from one session to another. The correlation between the ranks of these proportions and session numbers was computed for each word. The mean of these correlations was compared to zero (Table 7). The hypothesis that particular words would decreasingly occur as imitations over time was supported for the five children. A t test analysis of Spearman Rank Order Correlations between sessions and proportion

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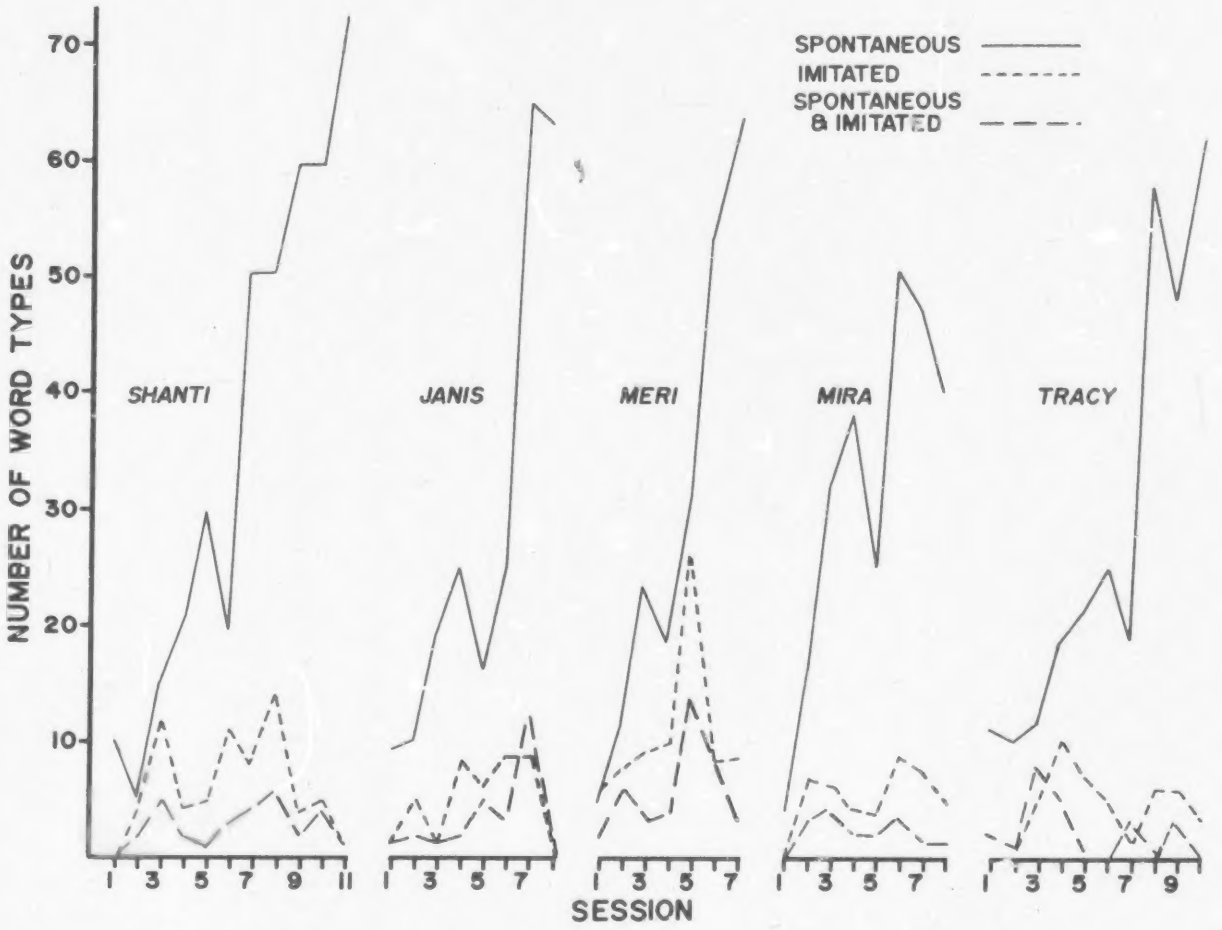

Figure 3. Number of single word types classified as imitated, spontaneous, and both imitated and spontaneous.

TABLE 7

RESULTS OF HYPOTHESIS TEST THAT THE MEAN CORRELATION BETWEEN SESSIONS AND PROPORTION OF IMITATIVE OCCURRENCES OF DIFFERENT WORDS IS NON-ZERO AND NEGATIVE

	Child				
	Shanti	Janis	Meri	Mira	Tracy
n	26	29	37	23	29
$\bar{x}$	-.52	-.38	-.24	-.30	-.68
s	.56	.63	.61	.80	.34
t	6.31	3.27	2.15	1.83	10.90
Significance level	<.001	<.005	<.02	<.04	<.001

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of imitated occurrences of particular words demonstrated that the correlation was non-zero and negative for all subjects at the .05 level of significance. Thus, the same words tended to be predominantly imitated in earlier sessions and predominantly spontaneous in later sessions.

Imitation of Multi-Word Utterances

Hypothesis 2D. When children begin using multi-word utterances, these are more likely to be imitative than are single-word utterances occurring at the same time.

The hypothesis was not supported by z tests for each subject and session (Table 8). Tracy, Shanti, and Mira each had one session toward the end of the research period in which multi-word utterances were imitated to a lesser extent than single words. Janis had one session toward the end of the research period where multi-words were imitated to a greater extent than single words. In the other sessions, the proportion of imitation for multi-word utterances did not differ significantly from that for single words. However, it was of interest to note that for four of the five children, single words were imitated to a significantly different extent than multi-word utterances during a period of rapid increase in the number of multi-word types used. The direction and magnitude of these changes were not consistent for the children.

TABLE 8

COMPARISON OF IMITATION RATES FOR SINGLE-WORD TYPES[a] AND MULTI-WORD TYPES[b]

Child	Session	Number of single types	Imitation[a] rate for single types	Number of multi-word types	Imitation[b] rate for multi-word types	z statistic
Shanti	VII	63	.127	18	.111	.182
	VIII	71	.197	95	.042	4.19**
	IX	65	.062	109	.018	1.54
Janis	VI	37	.243	5	.20	.21
	VII	86	.105	103	.272	-2.88**
	VIII	63	.000	111	.036	-1.51
Meri	V	71	.352	3	.333	.07
	VI	70	.100	29	.034	1.10
	VII	74	.068	97	.031	1.13
Mira	V	30	.100	3	.000	.57
	VI	62	.129	30	.067	.89
	VII	55	.127	104	.038	2.11*
	VIII	46	.109	120	.033	1.94*
Tracy	VII	23	.043	5	.000	.23
	VIII	64	.094	36	.000	1.91
	IX	57	.105	38	.000	2.01*
	X	65	.046	67	.045	.03

[a]This is the proportion of single-word types that occurred only as imitations in the session indicated.

[b]This is the proportion of multi-word types that occurred only as imitations in the session indicated.

*Significant at the .05 level.

**Significant at the .01 level.

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Action-Judgments

Identification of Action-Judgments

All words occurring for three or more sessions were examined to determine whether they coded relational aspects of the child's experience that would suggest their inclusion in the action-judgment class of utterances. Table 9 presents the words judged as action-judgments for each child. It is not suggested that these comprise the total of action-judgments for each subject but rather additional language samples might have located more action-judgments for some children. Despite this, the limited variety of action-judgment words used by the children was still notable. While each child included 8 or 10 word types of this sort in the repertoire, only 13 different word forms were observed across children. To the extent that these words code operational intelligence, as opposed to physical knowledge, one would expect a limited and overlapping group of words to emerge. However, a larger sample of subjects might have been less homogeneous with respect to the action-judgment word types they used.

Imitation of Action-Judgments

Hypothesis 3. Action-judgments are imitated to a lesser extent than other utterances produced by the child.

For this analysis, the subjects were first

TABLE 9

ACTION-JUDGMENTS OBSERVED FOR SUBJECTS

Words	Subject				
	Shanti	Janis	Meri	Mira	Tracy
Allgone	X	X	X	X	X
Bye bye		X			
Back	X		X		
Down	X			X	
Here	X	X	X	X	X
More	X	X	X	X	X
No	X	X		X	X
Okay					X
Open	X	X	X	X	X
Stuck	X		X		
There	X	X	X	X	X
Uh oh	X	X	X		X
Up			X	X	X

considered as a total group. Next, separate analyses were performed for each subject. Analysis was based on tokens (all occurrences of all words). For each session, the proportion of imitated to total occurrences for action-judgments was compared to the proportion of imitated to total occurrences for non-action-judgments. The sign test performed with subjects pooled indicated that the relative proportion of imitation for action-judgments was less than the proportion of imitation for other words. This result was significant at the .001 level (Table 10). Considering all children and all sessions, there were only 66 instances of an action-judgment used in imitation out of a total of 1,167 occurrences of action-judgments.

When the analysis was performed separately for each child, the results for Shanti, Mira, and Tracy were significant at the .05 level. For Janis and Meri, a significant result was not obtained. Meri's result approached significance ($\alpha = .06$).

The Relationship of Symbolic Development to the Language Variables

Symbolic Development and Imitation

Hypothesis 4A. The proportion of the child's utterances which are imitations is a function of symbolic development.

The similarity in the children's changing use of

TABLE 10

PROPORTION OF IMITATED TO NON-IMITATED OCCURRENCES FOR ACTION-JUDGMENTS (A-J) AND ALL OTHER SINGLE WORDS[a]

Session	Subject									
	Shanti		Janis		Meri		Mira		Tracy	
	A-J	Other	A-J	Other	A-J	Other	A-J	Other	A-J	Other
I	0/0	0/78	0/2	7/23	1/1	9/33[b]	0/7	0/10	0/4	5/33
II	0/1	8/46	16/27	25/52[b]	1/18	21/89	0/9	15/71	1/17	2/40[b]
III	7/13	36/122[b]	0/6	3/67	0/17	15/119	1/36	13/138	4/41	19/111
IV	1/14	6/102[b]	2/18	11/77	0/10	19/77	0/85	8/388	8/63	27/122
V	2/24	9/109	8/18	17/80[b]	2/11	58/166	0/20	6/145	2/15	11/71
VI	2/25	18/108	2/6	22/81[b]	0/46	25/250	0/27	14/268	0/29	14/81
VII	0/39	30/305	4/11	28/276[b]	1/30	9/223	0/44	10/106	1/14	5/44
VIII	0/47	28/237	0/24	0/139			0/14	7/137	0/72	9/254
IX	0/47	7/221							0/37	12/169
X	0/38	16/233							0/69	3/235
XI	0/14	2/179								
Level of sig.	.05		.62		.06		.004		.01	

[a]Each proportion gives the number of tokens which occurred as imitations divided by the total number of tokens in the category.

[b]Proportion of imitation for action-judgments is greater than that for all other single words.

[c]Level of significance, subjects pooled, is less than .001.

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imitation over time was noted in investigating hypothesis 2A. Since the imitation curves were not similarly placed with relation to age for the children, the possibility that the child's symbolic level was a factor here was investigated. A curvilinear regression equation of the form $y = Ax^Be^{CX}$, where y is the imitation rate based on word types and x is age, was fitted to the data for each child (Table 11). Because there were at least seven levels of age, as opposed to three categories for symbolic level, and the fact that age and level were highly correlated, it was decided to use age as an independent variable rather than symbolic level. The effect of symbolic level could then be investigated by inspection, and prediction of change points based on the regression equation. The equations fit the data well as indicated by the magnitude of the coefficient of multiple regression. The level of significance exceeded .05 for four children. The equation for Tracy approached significance at .06.

These data indicated that although the timing of imitation was not the same for the five children chronologically, it could be described by an equation with a specific functional form. The geometric shape described by this function began low, reached a high peak, and then declined. Each predicted function had a clear maximum as did the obtained distributions of the subjects. Both the

TABLE 11

NUMERICAL RESULTS OF REGRESSION OF IMITATION RATE ON AGE

Child	*r*	*F*	Level of significance	Coefficients		
				A*	B*	C*
Shanti	.91	17.5	.002	4.297	-8.245	2.467
Janis	.92	11.8	.02	21.511	-25.851	13.966
Meri	.89	7.4	.04	7.524	-12.356	3.910
Mira	.93	13.1	.02	-5.703	2.852	3.040
Tracy	.74	4.4	.06	13.275	-15.496	12.011

Note. In order to perform the regression, the least squares fit to the following equation was obtained.

$$\ln y = A^* + B^* \left(\frac{x}{12} - 1\right) + C^* \ln \left(\frac{x}{12} - 1\right)$$

where y is the imitation rate and
x is the age in months

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predicted and obtained maxima occurred close in time to the attainment of symbolic Level 4 (Figures 4-8). Imitation tended to be high at the transition to Level 4.

Analysis of variance was performed to determine whether imitation varied with symbolic level. The symbolic levels were grouped into three categories because not all subjects had been observed at all levels. The categories of symbolic level used were: (a) Levels 1, 2, and 3; (b) Levels 4 and 5; and (c) Levels 6 and 7. (Table 3 summarizes these levels.) The main effect of level was significant at the .05 level. The effect of subjects was significant at the .05 level. The interaction between levels and subjects approached significance (.06) (Table 5). It was therefore necessary to consider the effect of the interaction in interpreting the results of the main effect.

Symbolic Development and Use of Action-Judgments

Hypothesis 4B. The number of different action-judgments used varies with symbolic level.

Considering each child separately, it was determined that the relative frequency of action-judgment tokens changed over time (Table 12). This result was obtained by chi-square analysis, where expected frequencies were derived from total occurrences of

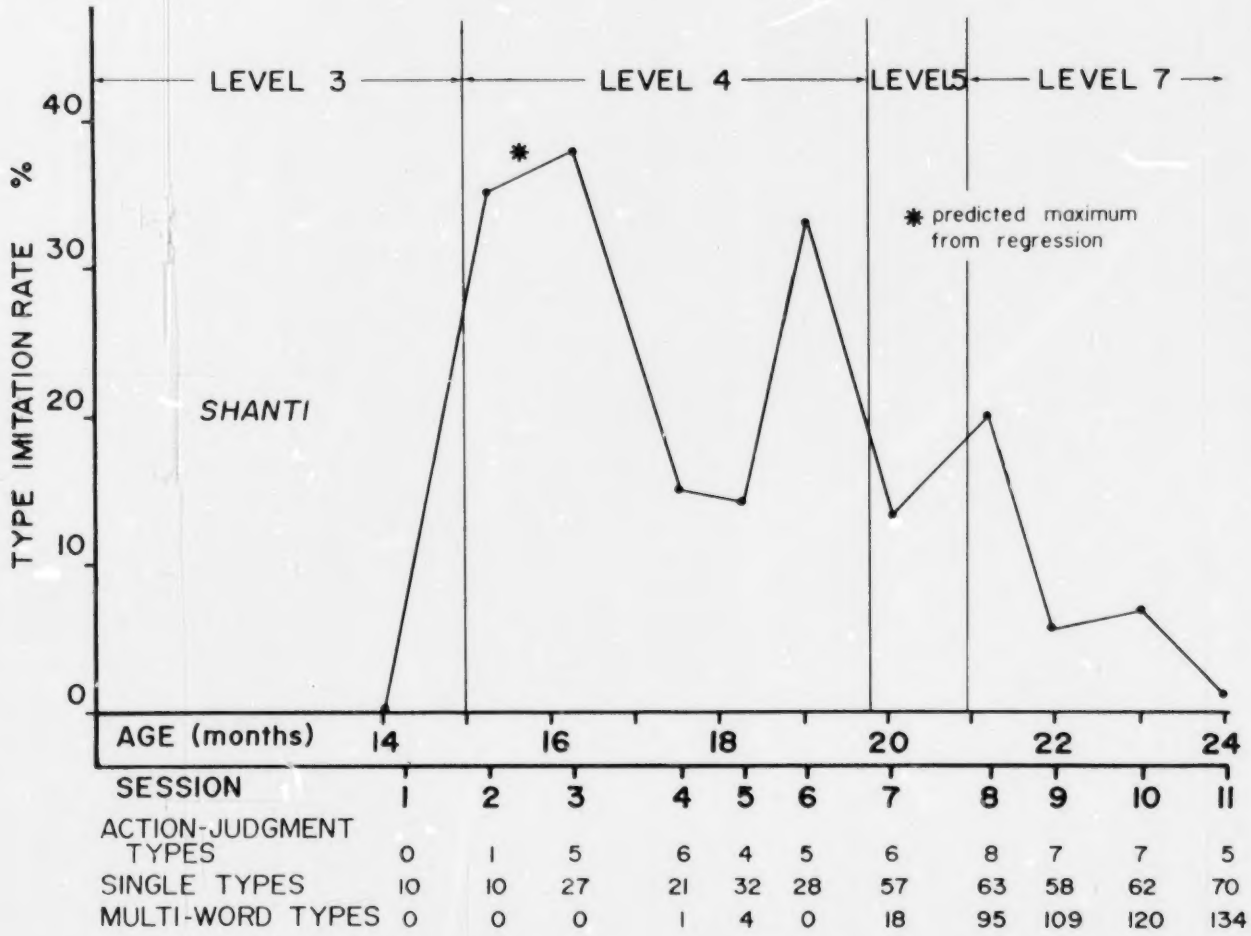
LEVEL 3
LEVEL 4
LEVEL5
LEVEL 7
TYPE IMITATION RATE %
40
30
20
10
0
SHANTI
* predicted maximum from regression
AGE (months) 14 16 18 20 22 24
SESSION 1 2 3 4 5 6 7 8 9 10 11
ACTION-JUDGMENT TYPES 0 1 5 6 4 5 6 8 7 7 5
SINGLE TYPES 10 10 27 21 32 28 57 63 58 62 70
MULTI-WORD TYPES 0 0 0 1 4 0 18 95 109 120 134

Figure 4. Summary information: Shanti.

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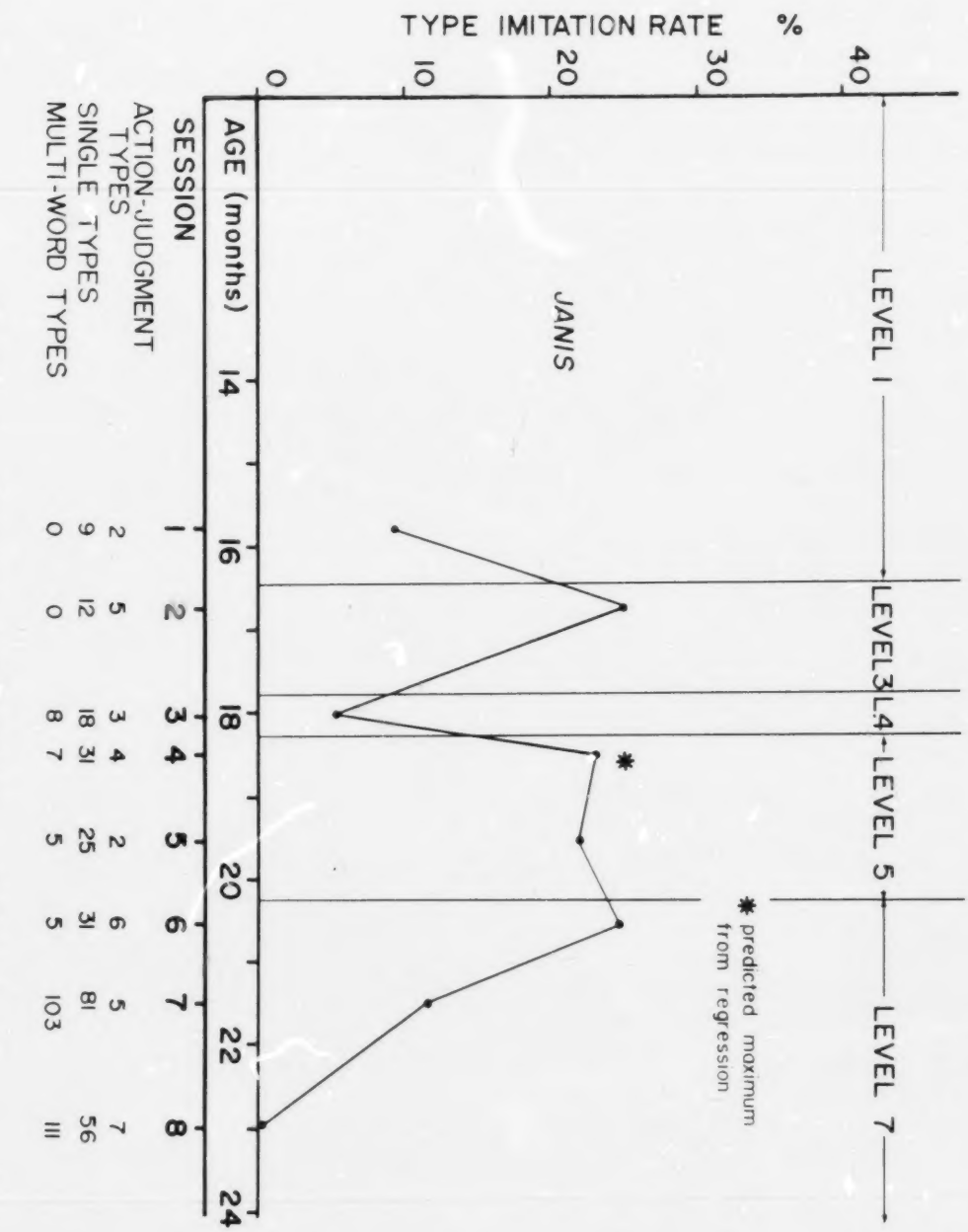

Figure 5. Summary information: Janis.

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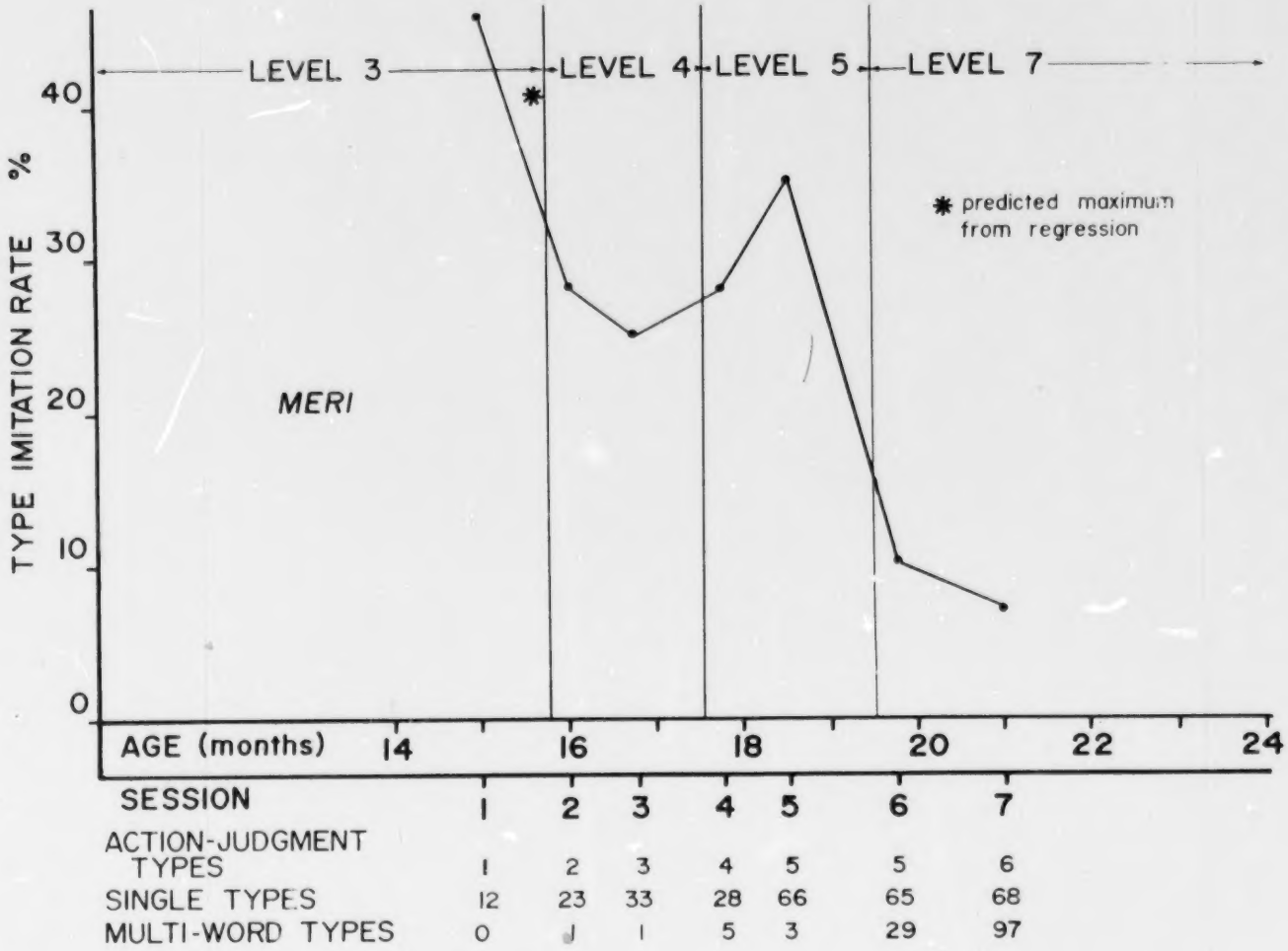

Figure 6. Summary information: Meri.

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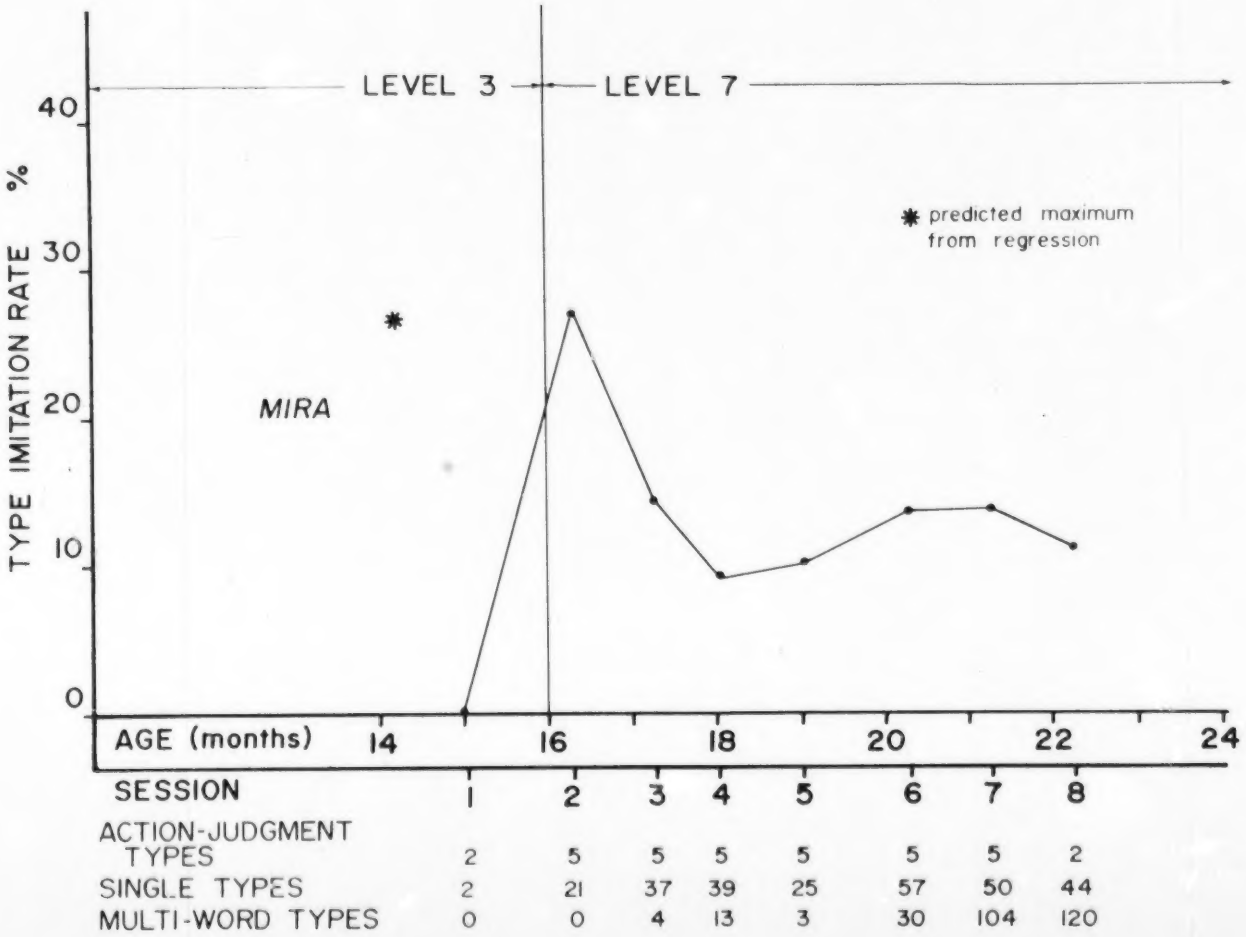
LEVEL 3
LEVEL 7
40
30
20
10
0
TYPE IMITATION RATE %
* predicted maximum from regression
MIRA
AGE (months) 14 16 18 20 22 24
SESSION 1 2 3 4 5 6 7 8
ACTION-JUDGMENT TYPES 2 5 5 5 5 5 5 2
SINGLE TYPES 2 21 37 39 25 57 50 44
MULTI-WORD TYPES 0 0 4 13 3 30 104 120

Figure 7. Summary information: Mira.

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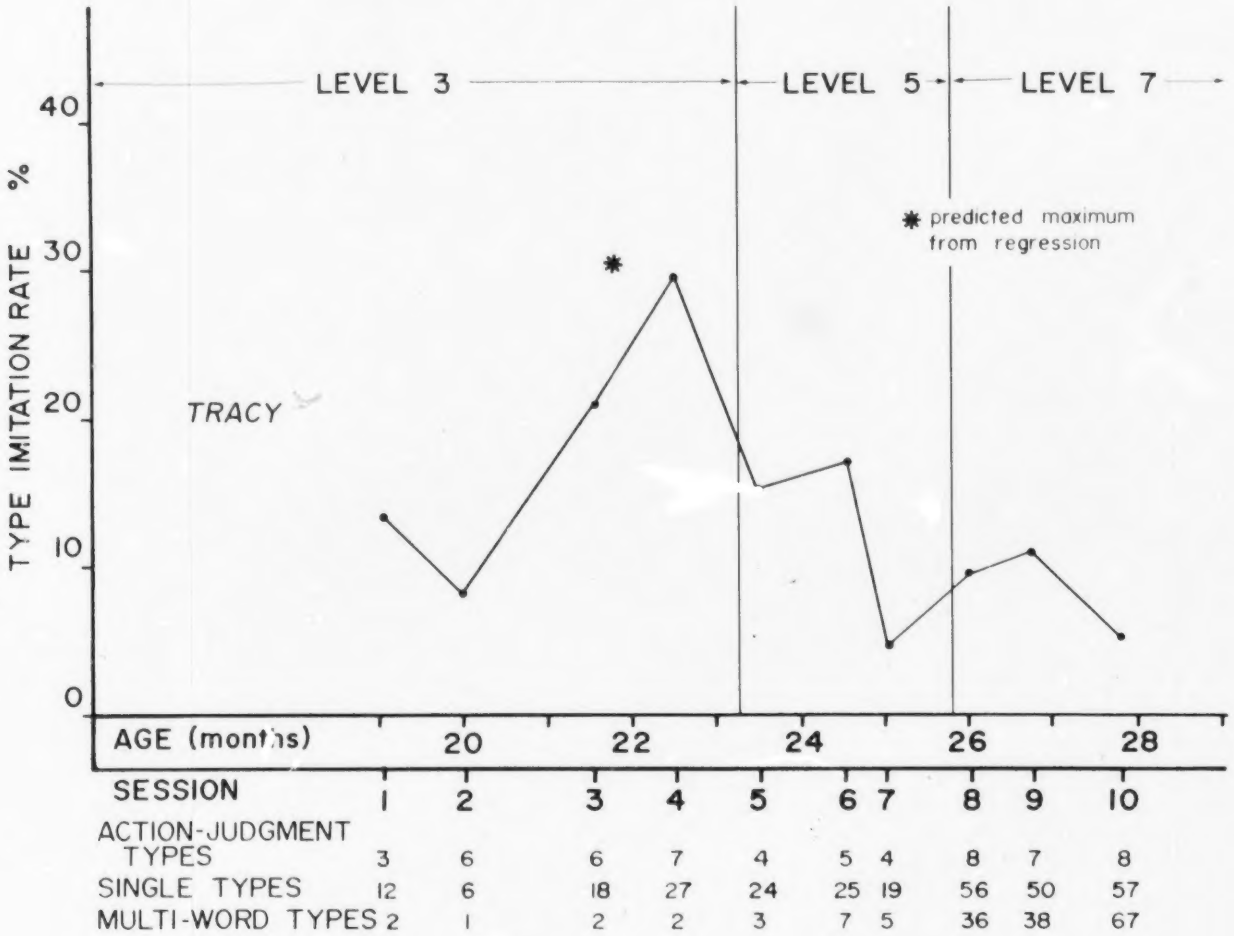

Figure 8. Summary information: Tracy.

TABLE 12

RELATIVE FREQUENCY OF ACTION-JUDGMENT (A-J) TOKENS BY SESSION

Sessions		Subject									
		Shanti		Janis		Meri		Mira		Tracy	
		A-J	Other	A-J	Other	A-J	Other	A-J	Other	A-J	Other
I	Obs.	0	78	2	21	1	32	7	3	4	29
	Exp.	11.7	66.3	3.2	19.8	4.2	27.8	1.8	8.2	10	23
II	Obs.	1	45	27	25	8	81	9	62	17	23
	Exp.	6.9	39.1	7.3	44.7	11.4	77.6	12.6	58.4	12.1	27.9
III	Obs.	13	109	6	61	17	102	36	102	41	70
	Exp.	2	120	9.4	57.6	15.3	103.7	24.5	113.5	33.7	77.3
IV	Obs.	14	88	18	59	10	67	85	303	63	59
	Exp.	15.4	86.6	10.8	66.2	9.9	67.1	68.9	319.1	37.0	85
V	Obs.	24	85	18	62	11	155	20	125	15	56
	Exp.	16.4	92.6	11.3	68.7	21.3	144.7	25.7	119.3	21.5	49.5
VI	Obs.	25	83	6	75	46	204	27	241	29	52
	Exp.	16.4	91.6	11.4	69.6	32.1	217.9	47.6	220.4	24.6	56.4
VII	Obs.	39	266	11	265	30	193	44	162	14	30
	Exp.	45.9	259.1	38.9	237.1	28.7	194.3	36.6	169.4	13.4	30.6

(continued)

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TABLE 12 (continued)

Sessions		Subject									
		Shanti		Janis		Meri		Mira		Tracy	
		A-J	Other	A-J	Other	A-J	Other	A-J	Other	A-J	Other
VIII	Obs.	47	190	24	115			14	123	72	182
	Exp.	35.7	201.3	19.6	119.4			24.3	112.7	77.1	176.9
IX	Obs.	47	174							37	132
	Exp.	33.3	187.7							51.3	117.7
X	Obs.	38	195							60	175
	Exp.	35.1	197.9							71.3	163.7
XI	Obs.	14	165								
	Exp.	27.0	152								
χ^2		48.92		101.43		16.87		30.86		499.22	
Level of significance		.01		.01		.01		.01		.01	

Note. To obtain the expected frequencies for each session, the proportion of utterance tokens in each category produced by the child across sessions was first determined. The number of utterance tokens expected in each session was then calculated by applying these proportions to the total number of tokens produced by the child in a given session.

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action-judgments and non-action-judgments over all sessions.

Correlation analysis of number of action-judgment types with symbolic level was used to compare the growth of this class of utterances with symbolic development. Considering all subjects pooled, the Pearson Product-Moment Correlation was .55, significant at the .05 level. Figures 4-8 show the symbolic level and number of action-judgment types which occurred at each session for each child.

Symbolic Development and Use of Multi-Word Utterances

Hypothesis 4C. Some consistent minimum symbolic level is attained (a) when children begin combining words, and (b) when multi-word utterances come to predominate in their language.

The hypothesis that a minimum consistent level of symbolic development would be apparent when the children first gained competency in combining words, and when word combinations came to predominate in their repertoire, was supported for all subjects. The five subjects had achieved Level 4 (Single Schema Symbolic Combinations) when they exhibited three or more different multi-word combinations in a session. They had similarly attained Level 7 (Planned Multi-Schema Combinations) when

multi-word types were more numerous than single-word types (Table 13 and Figures 4-8). Under the null hypothesis that the multi-word competencies are equally likely to emerge before the designated level, as at or after it, the probability of the observed result is .03. This probability is based on Fisher's randomization test.

Since mean length of utterance (MLU) is considered a major indicator of linguistic maturity (Brown, 1973), a stepwise regression was performed with age and symbolic level as independent variables and mean length of utterance as the dependent variable.

The following results were obtained. The most effective predictor of MLU was the influence of age and level combined, so the interaction of age with level was the variable entered first. When the separate effects of age and level were incorporated in the equation, they added little to the predictive power of the regression. The resulting equation accounted for 40% of the variability. The correlation between each of the independent variables and the dependent variable was approximately .60. Investigation of correlations among the independent variables indicated strong linear relationships. Thus, any of these variables would serve as well in predicting mean length of utterance.

TABLE 13

SYMBOLIC LEVEL AND NUMBER OF DIFFERENT MULTI-WORD UTTERANCES

Time	Shanti		Janis		Meri		Mira		Tracy	
	Level	Number of multi-word types	Level	Number of multi-word types	Level	Number of multi-word types	Level	Number of multi-word types	Level	Number of multi-word types
I	3	0	1	0	3	0	3	0	3	2
II	4	0	3[a]	0	4	1	7[a]	0	3	1
III	4	0	4	8	4[a]	1	7	4	3	2
IV	4[a]	1	5	7	5	5	7	13	3[a]	2
V	4	4	5	5	5	3	7	3	5	3
VI	5	0	7[b]	5	7[b]	29	7[b]	30	5	7
VII	7[b]	18	7	103	7	97	7	104	5	5
VIII	7	95		111			7	120	7	36
IX	7	109							7[b]	38
X	7	120								67
XI	7	134								

[a]First session where at least three multi-word types were used.

[b]First session where multi-word types predominate.

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Summary of the Results

The results of this study demonstrated that the variables under analysis, symbolic level, imitative language, and the development of action-judgments and multi-word utterances, affect one another during the early period of language acquisition. There was consistency in the observation of these variables across subjects, although often one or another subject demonstrated a somewhat different pattern from the other four with respect to a particular variable (Figures 4-8).

With respect to imitation, all children showed variation in the extent of their use of imitation. There was a consistent pattern observable across children. The tendency was to have a low proportion of imitation early in the single-word period which then increased sharply and declined. Although the placement of this curve varied across time, the maximum of imitation occurred following Level 3 symbolic play, and early in Level 4.

Imitation was used selectively and progressively by all subjects. Particular words were more likely to occur only as imitations or only as spontaneous utterances rather than occurring in both ways in a given session. Words tended to be imitated in the early sessions where they occurred and to be used spontaneously in subsequent sessions.

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Multi-word utterances were no more likely to be imitated than single words, so the hypothesis that they would tend to occur first as imitations was not supported.

A small and overlapping number of action-judgments was identified for all children. These seldom occurred as imitations. Action-judgment word types were significantly less likely to occur as imitations than other single words occurring at the same time.

In relating symbolic level to the language variables, the greatest extent of imitation was found to occur similarly with respect to level, across subjects. The number of action-judgment types produced by the child in a given session was correlated with symbolic level ($r = .55$). A consistent minimum symbolic level (Level 4) had been reached when the children produced three or more multi-word combinations. Level 7 was attained by the children at or before the time when multi-word types predominated in their language.

CHAPTER IV

DISCUSSION

When the data were analyzed, the overall similarity of the children with respect to the variables under consideration was perhaps the most important result. Previous research had not considered the three variables--development of symbolic play, vocal imitation, and language--concurrently, so it was unknown whether the commonalities hypothesized would emerge. Piaget's (1962) levels of symbolic play had not previously been used as the basis for comparison with other variables. Longitudinal research of shorter duration which considered the role of vocal imitation in language development (Bloom et al., 1973) had categorized each child as an "imitator" or a "non-imitator."

In the present study, the five children in the sample had periods of imitative behavior in which they were imitators and other periods in which they were non-imitators according to the criteria used by Bloom et al. Similarly, while reference had been made to different classes of single-word utterances (Bloom, 1973; Sinclair, 1970), the development of this class of words had not been

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studied in relation to imitation or symbolic play.

In the following sections, attention is first given to certain individual differences between the children. Next, the sequence and rates of attaining the various symbolic levels are discussed. Then the imitation results are discussed and compared to results obtained by Bloom et al. (1973). Action-judgments, their special properties, and explanation concerning their relatively low occurrence as imitations are then examined. Finally, the relationship of symbolic level to the language variables is discussed.

Individual Differences Among the Subjects

When the children involved in this study were visited at home for observation and recording of behavior, individualities of each subject became readily apparent. The amount of language seemed to vary greatly from child to child during the early visits. Table 1 demonstrates that these observations were correct for the early visits. Shanti, Meri, and Mira produced more utterances per session than Janis and Tracy. By the final sessions recorded, these differences were much less pronounced. Shanti and Meri continued to produce the greatest number of words. Mira, Janis, and Tracy produced fewer utterances than did Shanti and Meri. The number of different utterances used in the final sessions were approximately the same for

the five subjects. Some variation in frequency of speaking can be expected; not all people are equally loquacious. Shanti, Meri, Mira, and Janis were producing similar numbers of multi-word utterances Tracy, who had taken a longer time period to reach the criterion of 25% multi-word utterances, was still producing fewer of these when the study came to a close.

The children also differed in their reaction to the exper mental sessions. Shanti, Meri, and Mira were relatively natural according to mothers' reports and the observation of the experimenters. Janis and Tracy showed a greater self-consciousness and awareness that they were being observed, and according to their mothers, did not speak as often during the visits as they normally did when they were at home.

Extra informal visits were made without video equipment in hopes of acclimating the children to the investigators. Longer sessions and more frequent visits were undertaken with Janis and Tracy to assure that language samples would be of adequate size for analysis. The effect of these individual differences in response to the experimental situation on the outcome of the research is difficult to determine. Janis reached the criterion of 25% non-imitated multi-word utterances at approximately the same age as the subjects who appeared more natural

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and produced greater numbers of utterances than she did. Tracy, who reached this language criterion several months later than the other children, also showed a similar time discrepancy in reaching the highest level of play.

Symbolic Level

The sequence of attaining the symbolic levels hypothesized was not violated by any subjects. However, there was variation in the number of months intervening between one level and the next and it often happened that a child first gave evidence of attaining two symbolic levels in a given session. In fact, Levels 6 and 7 first appeared in the same session for all subjects.

Level 5 involves the construction of unplanned symbolic sequences. Level 6, Planned Single-Schema Symbolic Acts, includes only one played action, while Level 7, Multi-Schema Combinations with Planned Elements, involves two or more play actions done in sequence. Levels 6 and 7 are based on the emergence of the basic skill to plan symbolic acts. Since the children have previously demonstrated the ability to construct unplanned play combinations (Levels 4 and 5), it is not surprising that when planned elements were constructed by the child, they were rapidly incorporated into the play combinations she invented.

Imitation

Consistency and Extent of Imitation

When the subjects in this study were observed, the fact that the rate of imitation was not constant for a particular child from time to time was not apparent to even a trained observer. From Bloom et al.'s (1973) results it was expected that the children would emerge as either "imitators," exhibiting a relatively high proportion of imitated utterances, or "non-imitators," who rarely engaged in vocal imitation.

It was further expected that the imitation would be selective and facilitative for imitators (that is, words would occur first as imitations, later as spontaneous utterances), and neutral for non-imitators. The results of this research were that all subjects showed a range of imitation that extended over at least 25 percentage points (Table 4).

In investigating the consistency and extent of imitation, Bloom et al. (1973) found that for the six subjects they observed there were inter-subject differences in the extent of imitation, but each child was consistent in the tendency to imitate or not to imitate across time. In this study, the opposite results have been obtained. All children demonstrated a broad range in the extent of their imitation; four of the five exhibited significant

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variation in the extent of imitation. There was similarity among children in their use of imitation over time (Figure 2). Although significant individual differences in the extent of imitation were demonstrated, the direction and magnitude of these differences were influenced by symbolic level. During the lowest symbolic level observed, there was variation between subjects, while at the higher levels, they were more homogeneous in their extent of imitation. This is discussed further when the relationship between symbolic development and imitation is considered. Imitation followed a similar pattern for the five children as demonstrated by the regression analysis. Meri, when first observed, exhibited a high proportion of imitation rather than beginning low as the other four children did. It is possible that she previously imitated to a lesser extent.

There are two major differences between the subjects in the Bloom et al. study and that reported here which may account for the differences observed. Although all subjects in both studies had a mean length of utterance (MLU) of approximately 1.0 when first recorded, the children in the Bloom study were linguistically more mature on selected indices than children observed in this study. Further, whereas both imitators in the Bloom research were boys, only girls were included as subjects in this study.

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Table 14 presents the language characteristics of Bloom's subjects at the time her study began and the characteristics of the sample in this investigation at the initial visit. MLU's were all higher for Bloom subjects. Her subjects also individually produced more word types and tokens per hour observed than did Shanti, Janis, Meri, Mira, and Tracy. Of the Nicolich subjects, only Tracy produced multi-word utterances at the first visit. For Bloom subjects, the number of different multi-word utterances produced ranged from 24 to 86 per hour.

The number of months observed for the study reported here ranged from 7 to 10 months per child. The Bloom study extended from 2 to 5 months per child. If Bloom's subjects were linguistically more mature when her observations began, it is possible that the apparent non-imitators, Allison and Gia, had previously completed a period where they imitated to a greater extent. Kathryn's imitation rate declined from 35% at the first visit to 10% seven weeks later, when her MLU was 1.89. This is similar to the sharp declines shown in Figure 3. MLU's at the base of these sharp declines were near 1.8 for subjects in the present investigation who were close to Kathryn's age when their imitation declined substantially. Peter and Eric, termed "imitators" in the Bloom study, could be considered comparable to Meri's sessions 1 through 4 or Janis'

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TABLE 14

LANGUAGE CHARACTERISTICS OF BLOOM AND NICOLICH SUBJECTS AT THE FIRST SESSION

	Age (months and weeks)	Mean length of utterance	Tokens per hour	Types per hour	Total syntactic types	Number of sessions	Number of months covered
Bloom							
Allison	16,3	1.06	404	70	11	4	5
Eric	19,1	1.10	77	24	23	4	4
Gia	19,2	1.12	156	37	83	4	4
Jane	18,2	1.29	229	70	82	2	2
Kathryn	21,0	1.32	183	86	226	3	3
Peter	21,1	1.04	203	59	21	7	4
Nicolich							
Shanti	14,1	1.0	117	15	0	11	10
Janis	15,3	1.0	33	16	0	8	7
Meri	15	1.0	48	19	0	7	6
Mira	15	1.0	15	6	0	8	7
Tracy	19	1.06	52	22	2	10	9

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sessions 4 through 7. In short, it is possible that Bloom's subjects might have exhibited a similar imitation function to the Nicolich subjects if they had been observed earlier in their development and observations had covered a longer period.

Another possibility for accounting for these discrepancies is the fact that maternal child interactions were observed in this study, while five of Bloom's six subjects were observed while interacting with an experimenter. Bloom notes that no differences were observed in the extent of imitation whether an experimenter or the mother was interacting with the child.

Selective and Progressive Properties of Imitation

Imitation was used selectively by each subject. Words which tended to be imitated in earlier sessions later occurred spontaneously. These results support the contention that imitation involves a cognitive process because some internal monitoring of incoming vocal stimuli would appear to be needed to direct the selection process. The suggestion derived from Piaget (1962) that novelty with partial familiarity is a basis for the selection of models to be imitated was supported. The need for external imitation may arise because the discrepancy of the model from the child's conceptual or phonological system is an obstacle to complete internal processing.

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Imitation of Multi-Word Utterances

It had been hypothesized that in sessions where multi-word utterances occurred, these would have a higher proportion of imitation than single words. This was not supported. It was assumed that many phrases were learned as units or that imitation of multi-word utterances was a technique for learning allowable combinations in the syntax of the language. These assumptions were not justified.

Bloom et al. (1973) found that their subjects, Eric and Peter, imitated syntactic utterances for different reasons. One imitated structures not in his repertoire which included words he did use as single-word utterances, leading to syntactic progress. The other imitated structures in the repertoire which included words he did not use as single words, leading to lexical progress.

To account for such diverse functions of imitation, a more detailed analysis of the multi-word period than that undertaken here would be required. For imitations to be useful in learning multi-word language, it does not appear to be necessary for word combinations to be imitated to a greater extent than single words. The data analysis undertaken in this study did not include specific consideration of the function of imitation of multi-word utterances, but only the proportion of its

occurrence as compared with imitation of single words.

Imitation for the five children in this study had declined to a relatively low level (1% to 11% of utterance types were in the imitated category) when this research was completed (Table 4). None of the subjects had reached a mean length of utterance (MLU) of 2.0 at that time. Since children have been reported to continue imitating after MLU has exceeded 2.0 (Kemp & Dale, 1973), the question arises as to whether these children will subsequently use imitation as a tool for learning syntactic constructions.

Janis session VII was the only occasion where multi-word utterances were imitated to a greater extent than single words. Janis frequently imitated long utterances, repeatedly in a playful way. She had included a number of unanalyzed multi-word utterances in her early speech. This early linguistic behavior could lead to a greater ability to imitate longer utterances. She could be using a strategy for learning multi-word units not exhibited by the other subjects.

Shanti, Meri, Mira, and Tracy each had one session during the time when multi-word utterances were increasing rapidly, where these were imitated to a lesser extent than single words. This result is discussed below where consideration is given to imitation of action-judgments.

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Action-Judgments

The class of action-judgments, suggested as referring to operative categories of meanings rather than physically defined classes, comprised a small and overlapping group of words for all children. These meanings exhibited the sort of reversible relations which will later characterize logical mathematical reasoning.

Action-judgments were seldom imitated by the subjects during the study. The child invents these categories of words from acting on objects in the physical environment and abstracting the relations between them. For this reason the child appears to be minimally dependent on adult use of these words when developing the referential categories that surround them.

An incident occurred in this study which was suggestive of how independent action-judgments may be from adult models. Shanti (session VI) held the plastic fish out to her mother, saying "back." Her mother explained that it was not a "bug" but a fish. Shanti then imitated her mother, repeating "bug" several times. She then said "mommy," taking the large bottle from her, and repeated "back" several times as she put the fish "back" in the bottle. A few minutes later Shanti again used the word "back" when she wanted to put cookies in her cup where they had been before. At this point the cup had had juice

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in it and was sticky and damp. Her mother responded (perhaps interpreting "back" as "cup"), "No, I have your cup; we already put juice in it."

When the session ended, the mother was asked whether "back" rather than "bug" might have been what Shanti said in the episode where she put the fish in the bottle. The mother said she was not sure, but did not think Shanti used the word "back." She called a few days later to confirm that Shanti did use the word "back." When data from previous visits were analyzed, it was found that Shanti had been using "back" for the previous two months at least. This mother and child communicated exceptionally well with the mother often taking the opportunity to help Shanti learn names of things, or delimit categories when she overgeneralized. However, the word "back" was learned without notice, let alone help, from the mother. No doubt the model "put it back" was presented when Shanti was cleaning up toys, and perhaps on other occasions; but the extension of this word was an invention of the child to her own category of phenomena which could not be effectively "corrected" by an adult. Various applications of the category by the child would require a full sentence to code the relationship between the dynamic state "back" and various entities in the environment including their present, prior, and potential

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states with respect to this. It is this dependence on the child's invention for developing action-judgments that is suggested as an explanation for the infrequency of their imitation as a class.

The assumption that when multi-word utterances occurred they would occur first as imitations ignores the inventive aspect of coding relations with syntax. If grammatical knowledge is of the operative type, then initial relations coded might well be inventions of the child rather than copies of relations observed in the environment. Linguistic relations are no more directly observable to the child in language than the commutative property of numbers is observable in the physical make-up of pebbles. After the child has learned to code the relations he knows in language, imitation might be a strategy for refining the techniques for coding syntactic relations and gradually achieving the conventional coding process used in the native language. Bloom et al.'s subjects apparently employed this strategy effectively.

The Relationship of Symbolic Development to the Language Variables

One outcome of the analysis of symbolic play was the demonstration that other complex symbolic behavior occurred either prior to or contemporaneous with complex language (multi-word utterances). It was observed that

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language emerged in the framework of a set of interrelated abilities which apparently develop contemporaneously. The extent of vocal imitation varied with symbolic play level as did the use of action-judgments and multi-word utterance types.

Symbolic Development and Imitation

The influence of symbolic level on imitation was demonstrated by the occurrence of maximum imitation at the transition to Level 4 symbolic play (Figures 4-8). When the effect of symbolic levels and subject-to-subject differences on imitation were investigated, the relationship between symbolic level and imitation became more clear. The marginally significant interaction of child and level was influenced by wide variation in imitation at the lowest symbolic level observed (Levels 1, 2, and 3) (Table 5). Imitation rates at that level ranged from 0 to 46%. Whether this variation is representative of behavior at that level or due to sampling error is unknown. The other categories of symbolic level were more homogeneous with respect to rate of imitation. Individual differences among the subjects (significant at the .05 level) were no doubt influenced by the extensive variation in imitation observed at Levels 1 to 3.

Imitation was most consistently high at symbolic Levels 4 and 5, then declined at Level 7. This suggests

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the interpretation that there is a time when vocal imitation becomes useful to the child, which may be based on a combination of his capacity for mental representation and his recognition of words as relevant stimuli for imitation. The later decline in imitation occurs at Level 7, and when a sizable lexicon has been accumulated. It may be that external practice and problem solving using vocal imitation leads to an internalizing of these strategies. This is the same as the sequence proposed by Piaget (1962) whereby practicing solutions to sensorimotor problems externally and imitatively led to mental representation of such solutions. If this is the case, imitation might emerge later as a strategy for learning more advanced language skills such as syntax.

The case of Mira, who attained symbolic Level 7 at the second session, presented a pattern where Level 7 was attained early and vocal imitation subsequently declined. She was the only subject whose imitation rate did not differ significantly across sessions. Figure 7 indicates that with the exception of an imitation rate of 0.0 at the first session, and a rate of 27% at the second session (where she attained Level 7), Mira's imitation remained at a moderate level, ranging from 9 to 14%. The other subjects who spent a longer time progressing from Level 3 to Level 7 seem to have sustained higher proportions of

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imitation during this period of development (Figures 4, 5, 6, and 8). It is possible that Mira's more advanced symbolic capacity, as indicated by play, allowed her to use mental representation (covert imitation) for solving language problems that the other children attacked by overt imitation.

Symbolic Development and the Development of Action-Judgments

The child's use of action-judgments requires the ability to recognize dynamically similar events in the environment and construct a category which includes them. This ability to abstract the relational aspect of a situation is similar to the recognition by the child that action schemas (e.g., eating, sweeping) are not tied to particular situations, but are mobile, and therefore can be used playfully. The relationship between the use of symbols for play and for language is further explored with respect to multi-word combinations.

Symbolic Development and the Development of Multi-Word Utterances

Certain aspects of symbolic play are analogous to the formation of combinations of words and, later, sentences. Bloom (1973) observed her daughter's transition from single words to syntax, relating utterances to the child's actions and other conditions in the environment.

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During the period of transition, she noted:

> Chained successive single word utterances appeared to accompany performance of schemata, as Allison commented on alternative or successive steps toward a goal which could shift depending on the outcome of her movements [p. 42].

This description of how successive words, for Allison, related to successive actions is similar to the levels of symbolic play which were apparent when multi-word combinations were first observed in this study. Level 4 and Level 5 play are Simple Single-Schema Combinations and Simple Multi-Schema Combinations. The sequence of pretended actions at this level gives no evidence of prior planning, but one event leads to another depending on the outcome of the first event, material available in the vicinity, etc.

Bloom (1973) further suggested:

> The ability to mentally represent a complete action, object or goal would be a necessary condition for the eventual ability to psychologically co-ordinate several aspects for formulating the underlying semantic basis of a sentence [p. 43].

Level 7 play, Planned Multi-Schema Combinations, occurred prior to the time when multi-word utterances were more frequent in the child's language than single words. This was evidence in support of Bloom's suggestion.

Mira, who attained Level 7 at 16 months, seemed to indicate that experiences provided in the environment can accelerate some developmental phenomena. She has two

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older sisters (six and eight years older than she, respectively), who played with her often, probably influencing her early development of symbolic games. It is of interest that Mira did not begin to use word combinations until one month after Level 7 had been observed. Combinations did not come to predominate in her language until five months after she had achieved Level 7. Her ability to plan a series of symbolic actions, as demonstrated in play, did not immediately become apparent with respect to forming a series of symbols in language. It may be that although the cognitive prerequisite of representing a series of actions in advance was present, Mira needed to gain more knowledge of language itself and the various relations in the environment that could be coded with language.

Mira was similar to the other children in the sense that from the time when Level 4 play was observed to the time that multi-word utterances predominated, a lag of from four to six months occurred (Figures 4-8). Level 4 skills, then, had been available for exercise in the language and non-language behavior of all of the children for several months, prior to the predominance of syntactic language.

The major accomplishment of Level 4 (Single-Schema Combinations) is that the child demonstrates understanding

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of the generality and sequential possibilities of the schemas played. Only a single action is played, but it is used as a means of relating to various people and materials in the environment. It is also of interest that the maximum frequency of vocal imitation occurred at approximately Level 4. It may be that the generality of borrowing verbal schemas, and initial experiments with sequencing them, are manifestations of the same underlying development which allows the child to generalize and combine play schemas. This ability to generalize and combine is a reflection of what Werner and Kaplan (1963) refer to as distancing between a symbolic-vehicle (word or action) and its referent. They claim some unspecified degree of distancing is required before children learn syntactic speech.

During the several months' lag between the achievement of Level 4 and the predominance of multi-word utterances, the child has the opportunity to use these skills of imitating and combining to add to his repertoire of words to be used with reference to happenings in the environment that can be coded by language. During this time, the use of action-judgments indicated the children's awareness of, and interest in, various relations in the environment which would later be coded syntactically.

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Summary and Conclusions

The purpose of this investigation was to examine the level of symbolic capability as revealed in play, the use of spontaneous vocal imitation and its relationship to symbolic level, and the nature of certain classes of words occurring in spontaneous language. These three facets of child behavior were examined during the period of single-word utterances and early multi-word combinations with a view of elucidating certain cognitive aspects of early language.

Evidence regarding the sequential development of symbolic play has been suggested in the theoretical literature by Piaget (1962) and Bruner, Olver, and Greenfield (1966). This phenomenon has also been demonstrated by Sinclair (1970). The functions of spontaneous vocal imitation have been explored by Bloom et al. (1973) to determine how imitation leads to lexical development and the development of semantic-syntactic relations in language. Lezine (1971, unpublished) suggested that coordinations in play behavior constitute the roots of logico-mathematical structures. Bloom (1973) demonstrated that certain single-word utterances code relationships in the environment.

Specifically, this study examined the following variables: level of symbolic play, use of spontaneous

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vocal imitation, and cognitive aspects of certain word classes. The temporal sequencing of development in these areas was then compared. Concomitantly, methodological refinements were called for to establish symbolic play levels as a system for yielding reliable levels of cognitive development emerging late in the sensorimotor period. Further, there was a need for research beginning earlier in language acquisition, and thus extending for a longer period of development than had previously been reported for these particular variables. Children in this study were observed from the early part of the single-word period, until multi-word utterances comprised 25% of their language in a given sample. At the time of initial observation, they had achieved the sixth sensorimotor stage (Corman & Escalona, 1969).

Five female subjects ranging in age from 14 to 19 months at the time the study began were observed monthly in the home for 40-minute periods over a one-year time span. The children were presented with a standard set of toys and engaged in free play and conversation with their mothers. These sessions were videotaped, transcribed, and the following analyses performed.

The videotape was divided into play episodes, each of which was judged and assigned a symbolic play level as suggested by Piaget (1962). Reliability of coding was .85,

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significant at the .05 level. The language and contextual information were transcribed and child utterances compared to preceding maternal utterances to determine whether the utterances were imitative. The non-naming words used by each child for three or more sessions were identified. The contextual material included in the transcripts was then examined to determine whether conditions accompanying the occurrence of the identified words justified their inclusion in the action-judgment class.

The following results were obtained:

1. Children progressed through the play levels at varying paces, but in the order described by Piaget.

2. All children used vocal imitation, following a similar functional form $y = Ax^{B}e^{Cx}$ where y is imitation rate and x is age. The fit to this regression equation was significant for four children at level .05, the fifth at .06. The proportion of imitation varied extensively over time for each subject. Words were selectively imitated during the course of the study moving from imitated to spontaneous use.

3. The extent of vocal imitation was a function of symbolic development. The maximum of the predicted vocal imitation function occurred at a relatively consistent symbolic level for all children, as did the later accomplishment of predominantly multi-word language.

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4. A small class of single-word utterances was identified which apparently code reversible relations derived from sensorimotor experience and prefiguring operational intelligence. These words as a group were rarely imitated during the course of the investigation.

The major conclusions of this study are that there are consistent patterns of vocal imitative behavior and of symbolic development. The use of language to code precursors of operational intelligence was remarkably consistent for all children observed. It is suggested that common cognitive skills developed during the sensorimotor period form the foundation for these patterns of development.

Subsequent research on these issues could include longer term investigation of the variables considered here and investigation of related questions suggested by these results. It would be of interest to monitor the development of object permanance from early in the sensorimotor period and observe the associated vocal behavior to determine whether attainment of a particular sensorimotor stage is a necessary precursor of language. Concomitantly the imitativeness of initial language should be investigated to determine the variability across subjects during the initial language learning phase. The role of imitation during the multi-word period is a question left unanswered

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in this study which can be investigated by analysis of subsequent language samples from the subjects discussed here.

The present study has investigated the relationship of child to maternal utterances; the maternal utterances themselves are a vital source of information concerning the child's language learning experience. Play analysis has been employed in this study only to assess the symbolic development of the subjects. A fuller analysis including symbolic and non-symbolic play would provide valuable information about children's play choices, attention, and ability. Finally the action-judgment class of utterances has been described only in general terms. Subsequent investigation should provide detailed information about the development of meanings for these words and the generality of these meanings and their sequence of acquisition across children.

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